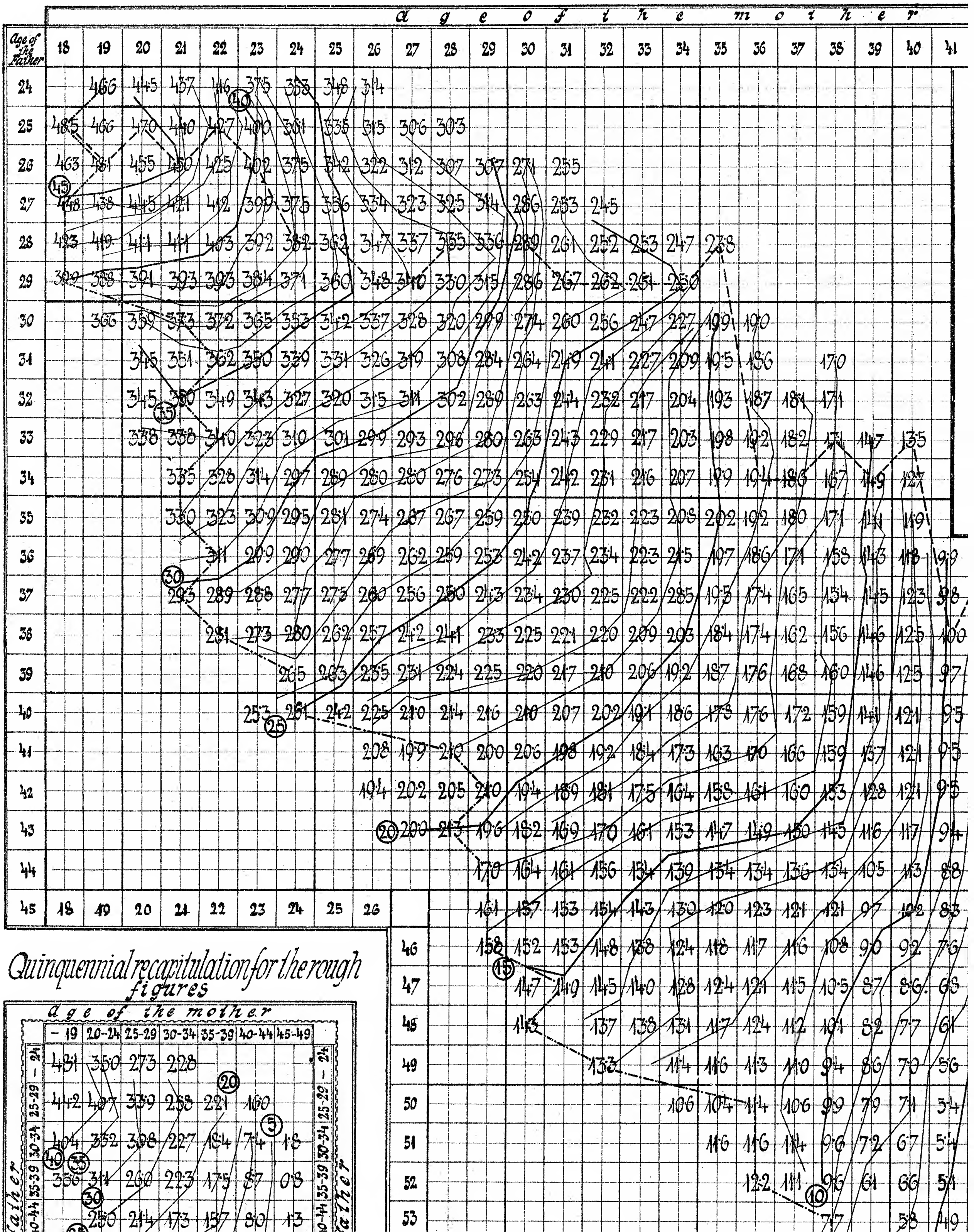
Bigenous Probability of annual births in 100 fam

according to the age of the father and of the mother respective

Table 3. *Adjusted figures, including also the isogens.*



Age of the Father	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
24		46·6	44·5	43·7	41·6	37·5	35·3	34·8	31·4															
25	48·5	46·6	47·0	44·0	42·7	40·0	36·1	33·5	31·5	30·6	30·3													
26	46·3	48·1	45·5	45·0	42·5	40·2	37·5	34·2	32·2	31·2	30·7	30·7	27·1	25·5										
27	44·8	43·8	44·5	42·1	41·2	39·9	37·5	35·6	33·4	32·3	32·5	31·4	28·6	25·3	24·5									
28	42·3	41·9	41·1	41·1	40·3	39·2	38·2	36·2	34·7	33·7	33·5	33·6	28·9	26·1	25·2	25·3	24·7	23·8						
29	39·9	38·8	39·1	39·3	39·3	38·4	37·1	36·0	34·8	34·0	33·0	31·5	28·6	26·7	26·2	25·1	25·0							
30		36·6	35·9	37·3	37·2	36·5	35·3	34·2	33·7	32·8	32·0	29·9	27·4	26·0	25·6	24·7	22·7	19·9	19·0					
31			34·5	35·1	36·2	35·0	33·9	33·1	32·6	31·9	30·8	28·4	26·4	24·9	24·1	22·7	20·9	19·5	18·6		17·0			
32			34·5	35·0	34·9	34·3	32·7	32·0	31·5	31·1	30·2	28·9	26·3	24·4	23·2	21·7	20·4	19·3	18·7	18·1	17·1			
33			33·8	33·8	34·0	32·3	31·0	30·1	29·9	29·3	29·6	28·0	26·3	24·3	22·9	21·7	20·3	19·8	19·2	18·2	17·1	14·7	13·5	
34				33·5	32·8	31·4	29·7	28·9	28·0	28·0	27·6	27·3	25·4	24·2	23·1	21·6	20·7	19·9	19·4	18·6	16·7	14·9	12·7	
35				33·0	32·3	30·9	29·5	28·1	27·4	28·7	26·7	25·9	25·0	23·9	23·2	22·3	20·8	20·2	19·2	18·0	17·1	14·1	11·9	
36					31·1	29·9	29·0	27·7	26·9	26·2	25·9	25·3	24·2	23·7	23·4	22·3	21·5	19·7	18·6	17·1	15·8	14·3	11·8	9·9
37				29·3	28·9	28·8	27·7	27·5	26·0	25·6	25·0	24·3	23·4	23·0	22·5	22·2	28·5	19·5	17·4	16·5	15·4	14·5	12·3	9·8
38					28·1	27·3	28·0	26·2	25·7	24·2	24·1	23·3	22·5	22·1	22·0	20·9	20·3	18·4	17·4	16·2	15·6	14·6	12·5	10·0
39							26·5	26·3	23·5	23·1	22·4	22·5	22·0	21·7	21·0	20·6	19·2	18·7	17·6	16·8	16·0	14·6	12·5	9·7
40						25·3	26·1	24·2	22·5	21·0	21·4	21·6	21·0	20·7	20·2	19·1	18·6	17·8	17·6	17·2	15·9	14·1	12·1	9·5
41									20·8	19·9	21·0	20·0	20·6	19·8	19·2	18·4	17·3	16·3	17·0	16·6	15·9	13·7	12·1	9·5
42									19·4	20·2	20·5	21·0	19·4	18·9	18·1	17·5	16·4	15·8	16·1	16·0	15·3	12·8	12·1	9·5
43										20·0	21·3	19·6	18·2	16·9	17·0	16·1	15·3	14·7	14·9	15·0	14·5	11·6	11·7	9·4
44												17·0	16·4	16·1	15·6	15·4	13·9	13·4	13·4	13·6	13·4	10·5	11·3	8·8
45	18	19	20	21	22	23	24	25	26			16·1	15·7	15·3	15·4	14·3	13·0	12·0	12·3	12·1	12·1	9·7	10·2	8·3
46												15·8	15·2	15·3	14·8	13·8	12·4	11·8	11·7	11·6	10·8	9·0	9·2	7·6
47													14·7	14·9	14·5	14·0	12·8	12·4	12·1	11·5	10·5	8·7	8·6	6·8
48													14·3		13·7	13·8	13·1	11·7	12·4	11·2	10·1	8·2	7·7	6·1
49															13·3		11·4	11·6	11·3	11·0	9·4	8·6	7·0	5·6
50																	10·6	10·4	11·4	10·6	9·9	7·9	7·1	5·4
51																		11·6	11·6	11·4	9·6	7·2	6·7	5·4
52																			12·2	11·1	9·6	6·1	6·6	5·1
53																					7·7		5·8	4·9

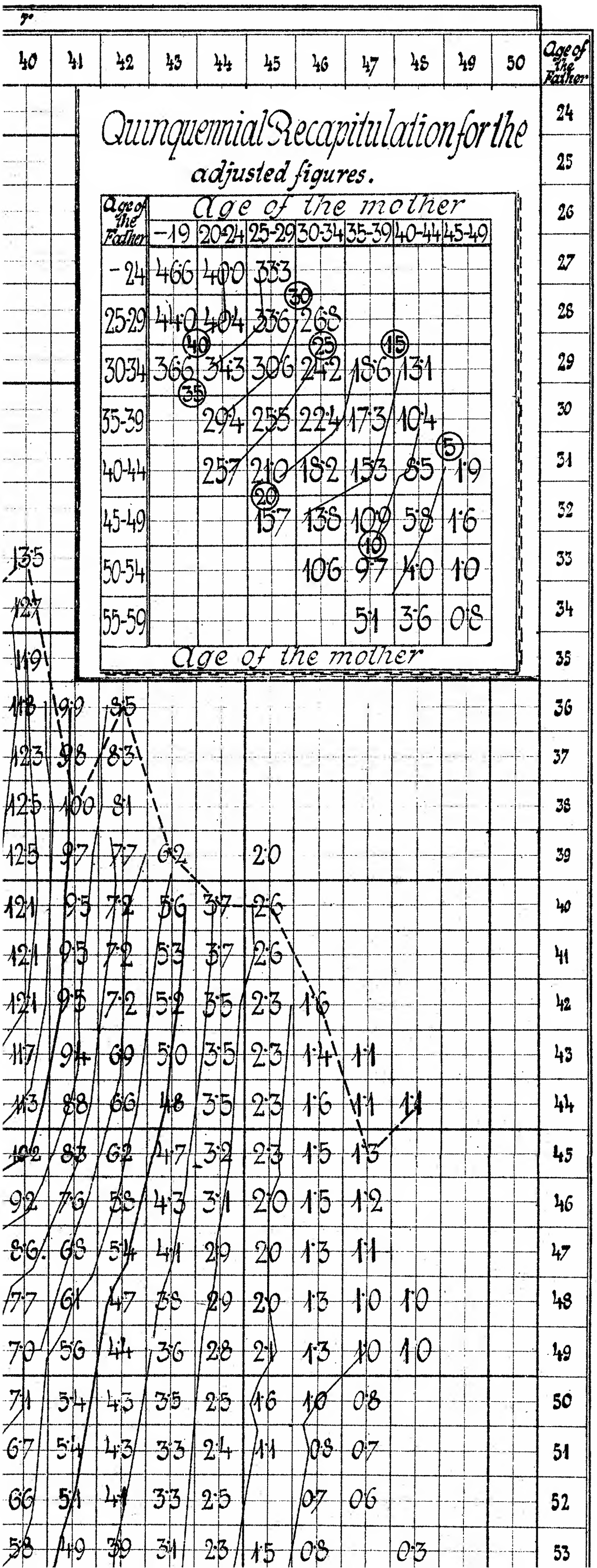
Quinquennial recapitulation for the rough figures

age of the mother

	– 19	20-24	25-29	30-34	35-39	40-44	45-49	
– 24	48·1	35·0	27·3	22·8				– 24
25-29	44·2	40·7	33·9	25·8	22·1	16·0		25-29
30-34	40·4	33·2	30·8	22·7	18·4	7·4	1·8	30-34
35-39	35·6	31·1	26·0	22·3	17·5	8·7	0·8	35-39
40-44		25·0	21·4	17·3	15·7	8·0	1·3	40-44

families

ectively

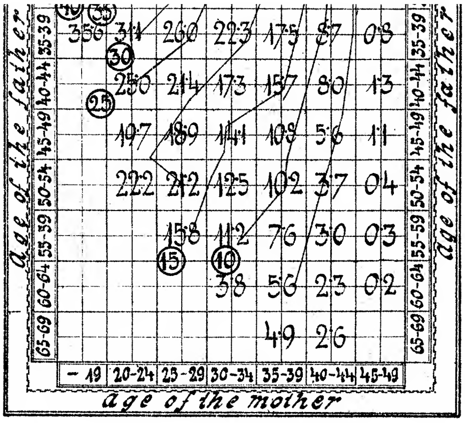


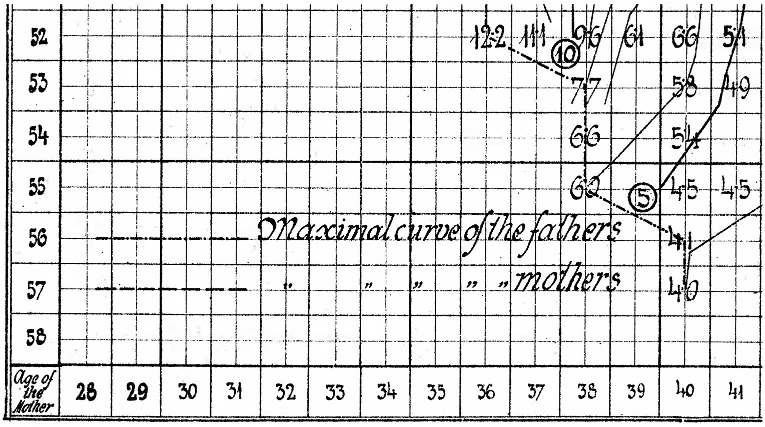
Quinquennial Recapitulation for the adjusted figures.

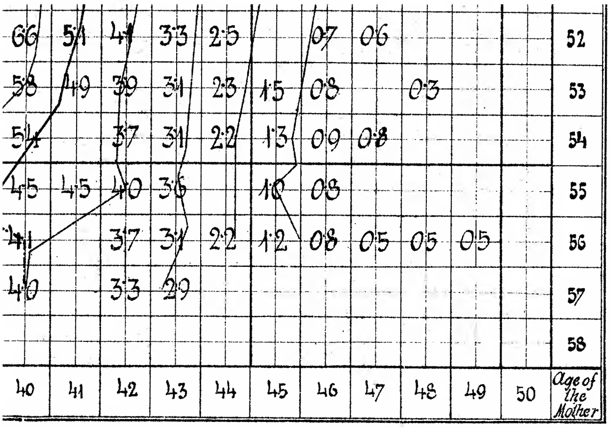
Age of the Father	Age of the mother −19	20-24	25-29	30-34	35-39	40-44	45-49
−24	46·6	40·0	33·3				
25-29	44·0	40·4	33·6	26·8			
30-34	36·6	34·3	30·6	24·2	18·6	13·1	
35-39		29·4	25·5	22·4	17·3	10·4	
40-44		25·7	21·0	18·2	15·3	8·5	1·9
45-49			15·7	13·8	10·9	5·8	1·6
50-54				10·6	9·7	4·0	1·0
55-59					5·1	3·6	0·8

Age of the mother

40	41	42	43	44	45	46	47	48	49	50	Age of the Father
											24
											25
											26
											27
											28
											29
											30
											31
											32
13·5											33
12·7											34
11·9											35
11·8	9·9	8·5									36
12·3	9·8	8·3									37
12·5	10·0	8·1									38
12·5	9·7	7·7	6·2		2·0						39
12·1	9·5	7·2	5·6	3·7	2·6						40
12·1	9·5	7·2	5·3	3·7	2·6						41
12·1	9·5	7·2	5·2	3·5	2·3	1·6					42
11·7	9·4	6·9	5·0	3·5	2·3	1·4	1·1				43
11·3	8·8	6·6	4·8	3·5	2·3	1·6	1·1	1·1			44
10·2	8·3	6·2	4·7	3·2	2·3	1·5	1·3				45
9·2	7·6	5·8	4·3	3·1	2·0	1·5	1·2				46
8·6	6·8	5·4	4·1	2·9	2·0	1·3	1·1				47
7·7	6·1	4·7	3·8	2·9	2·0	1·3	1·0	1·0			48
7·0	5·6	4·4	3·6	2·8	2·1	1·3	1·0	1·0			49
7·1	5·4	4·3	3·5	2·5	1·6	1·0	0·8				50
6·7	5·4	4·3	3·3	2·4	1·1	0·8	0·7				51
6·6	5·1	4·1	3·3	2·5		0·7	0·6				52
5·8	4·9	3·9	3·1	2·3	1·5	0·8		0·3			53


age of the father
age of the mother
35-39
40-44
45-49
50-54
55-59
60-64
65-69
– 19
20-24
25-29
30-34
35-39
40-44
45-49
40
35
30
25
15
10
35.6 31.1 26.0 22.3 17.5 8.7 0.8
25.0 21.4 17.3 15.7 8.0 1.3
19.7 18.9 14.1 10.8 5.6 1.1
22.2 21.2 12.5 10.2 3.7 0.4
15.8 11.2 7.6 3.0 0.3
3.8 5.6 2.3 0.2
4.9 2.6


52
53
54
55
56
57
58
Age of the Mother
28
29
30
31
32
33
34
35
36
37
38
39
40
41
12.2 11.1 9.6 6.1 6.6 5.1
7.7 5.8 4.9
6.6 5.4
6.2 4.5 4.5
4.1
4.0
10
5
Maximal curve of the fathers
" " " " mothers



40	41	42	43	44	45	46	47	48	49	50	Age of the Mother
6·6	5·1	4·1	3·3	2·5		0·7	0·6				52
5·8	4·9	3·9	3·1	2·3	1·5	0·8		0·3			53
5·4		3·7	3·1	2·2	1·3	0·9	0·8				54
4·5	4·5	4·0	3·6		1·0	0·8					55
4·1		3·7	3·1	2·2	1·2	0·8	0·5	0·5	0·5		56
4·0		3·3	2·9								57
											58

KÖRÖSI, TABLE OF NATALITY.

XVIII. *An Estimate of the Degrees of Legitimate Natality as derived from a Table of Natality compiled by the Author from his Observations made at Budapest.*[*]

By JOSEPH KŐRÖSI, *Member of the Hungarian Academy of Sciences, Director of Municipal Statistics.*

Communicated by Sir JAMES PAGET, *F.R.S.*

Received December 28, 1893. Read January 18, 1894. Revised August, 1894.

[PLATE 30.]

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[*] An abstract of this paper, as originally communicated, is to be found at p. 16, vol. 55, of the 'Proceedings,' under the title "An Estimate of the Degree of Natality, as shown in the Table of Natality compiled by the Author from Observations made at Budapest." Considerable modifications have since been introduced; in particular, Chapter IV. (on Isogens) has been added, in consequence of the paper on "Isogens," by Mr. FRANCIS GALTON ('Proceedings,' vol. 55, p. 18), the reading of which followed that of Mr. KŐRÖSI's paper.—M.F.

30.4.96.

I. PRELIMINARY REMARKS.

Introduction.

Statistics applied to the subject-matter of different sciences are merely a method: but statistics exist also as an independent science, the contents of which represent the demological facts obtained by application of the statistical method.

The two branches of demological science, that is, statistics of natality and of mortality, are, both of them, sprung from the soil of England. It was in 1665 that the Royal Society, by publishing the 'Natural and Political Observations,' written by Captain JOHN GRAUNT three years before, laid the foundation stone of that science which, under the name of Vital Statistics, or Demology (Demography), forms the scientific nucleus of statistical researches.

When GRAUNT published, 230 years ago, the outlines of this science, he could not foresee the great extension which it would take, especially in consequence of the establishment of special offices for the collection of statistics. Notwithstanding that, it is indeed striking to see how large a part of those demological problems which occupy us to-day GRAUNT brought up at the first throw, and with what keenness of vision he recognized not only the bifurcation into statistics of natality and of mortality, but also that other bifurcation which vital statistics show in respect to its place amongst the other sciences. The double character of statistics as a science has, in the course of centuries, been emphasized by the fact that statistics have been classed on the one side with the political, and on the other with the anthropological, group of the natural sciences. GRAUNT shows in the mere title of his book how well he is aware of this double character of his new science: he calls his observations both "political and natural." This conviction comes out still plainer in the two dedications, of which—in a most characteristic way—one is addressed to the minister, JOHN ROBERTS, Lord TRURO, the other to the President of the Royal Society, Sir ROBERT MORAY; so that one dedication is addressed to the politician, the other to the natural philosopher.*

The new science soon found zealous cultivators at its place of birth, that is, in the midst of the Royal Society. Sir WILLIAM PETTY worked at both branches of this science, like the founder. But the famous astronomer, E. HALLEY, brought into special importance a particular portion of the statistics of mortality. The respective works of GRAUNT and PETTY dealt with the number of deaths, with the movement of mortality in general, its changes according to sex and season, the causes of death, &c., thus more with the purely descriptive part of the phenomena: HALLEY succeeded in approaching these observations from a new side. His mathematical acumen led him to recognize how the registrations of the age of death involved at the same time the possibility of obtaining the probability of death for the different degrees of age, and of thus discovering the law according to which a population dies. In this way came into being the first life-table, composed by HALLEY, on the Breslau registrations of death, and presented in 1693 (thus precisely two centuries ago) to the Royal Society.* The day on which HALLEY presented his life-table must be regarded as the birthday of that biometrical part of death statistics which since that time has undergone such great *essor* and such deep mathematical elaboration.

---

* Thus he says in the dedication to Sir ROBERT MORAY: "The observations which I happened to make upon the *Bills of Mortality* have faln out to be both *Political* and *Natural*, some concerning *Trade* and *Government*, others concerning the *Air*, *Countries*, *Seasons*, *Fruitfulness*, *Health*, *Diseases*, *Longevity*, and the proportions between the *Sex* and *Ages* of Mankind. All which I am humbly bold to think *Natural History* also, and consequently, that I am obliged to cast in this small mite into your great treasury of this kind."

Whilst the branch of death statistics found thus its scientific basis two centuries ago, the other branch of demology—that is, the natal statistics—has loitered far behind. More than a hundred years have passed since MALTHUS stated that great demological problem concerning the rapid multiplication of mankind—a problem which, since his time, stands as central argument in the controversy of the social question, and still occupies the attention of thinking men, and which will never more disappear from the horizon. Now, this great problem rests essentially on natal statistics. But, in spite of the century which had passed between GRAUNT and MALTHUS, the latter, in his proofs, had still to struggle against the insufficiency of the statistical basis. And even to-day, another century after MALTHUS, we are obliged to admit that this basis is still so defective that it is impossible to attempt, on such a foundation, a solution of MALTHUS's problems. The points of view from which we observe to-day the phenomena of natal statistics are hardly more numerous than a century ago, in the time of MALTHUS and SÜSSMILCH.

In another place I have dealt with the lacunæ shown by the natal statistics, and tried at the same time to prove how it would be possible to fill up many of them.† Amongst these lacunæ the most striking is the absence of a veritable, that is, complete table of natality,‡ which ought to be found as the complement of the tables of mortality ("life-tables") which exist for the other part of demology.

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* See the 17th volume of the 'Philosophical Transactions,' January, 1693: "An Estimate of the Degrees of the Mortality of Mankind, drawn from curious tables of the Births and Funerals at the city of Breslau, with an attempt to ascertain the Price of Annuities upon Lives," by Mr. E. HALLEY, R.S.S. And at the same place (March, 1693): "Some further Considerations on the Breslau Bills of Mortality."

† See the author's 'Demologische Beiträge' (Berlin, 1892): I. "On the Extension of Statistics of Mortality and Fertility."

‡ The term "natality" is formed on the pattern of "mortality," and has been diffused especially by BERTILLON. It means generally the whole subject of natal statistics. But, in the present paper, I attribute to this term a more restricted sense, meaning by it especially the probability of birth for a given age, and relating to the duration of a year. But as expressions like "male probability of births" are not only heavy, but might also be confounded with the term "probability of male births," I often prefer to use the term "natality."

2. *General Remarks on the Construction of a Table of Natality.*

The table of mortality ("life-table") shows for each year of age the probability of death in the course of one year. The table of natality ought to show, in a corresponding way, for each year of age of the parents, the probability of a birth during a year. Notwithstanding this parallelism of aim, the importance of the results is different. In the life-table we have to deal predominantly with the observations of a natural phenomenon, independent of human will. Not so with the case of fertility, which—partly, at least—is also influenced by voluntary causes. But since the phenomena of the voluntary order have also their regular course, and since the real effect of the law of population is finally the product of causes of both orders, it needs no special proof that these phenomena also ought to be subject to the measuring method of statistics. Therefore, we should not deny the legitimacy of the attempt to calculate the probabilities of birth, though it cannot be denied that the results to be expected stand further off from a natural law than the inquiries of biometry.

Another difference is presented by the fact that death is caused by the physical conditions of a single person only, fecundity by those of two. The probability of having a child at a given age varies much according to whether the other partner is young, middle-aged, or old. As we have continually to reckon with this circumstance, we may be allowed to introduce two denominations for the two species of natal probabilities, naming those which regard only one sex as *monogenous*, and those which take into consideration the age-combinations of both parents as *bigenous*. It is clear that only the latter ones deserve the name of a true Table of Natality. Further, let us name those tables which proceed by single years *specified*, and those where the ages are put together by greater (quinquennial, decennial, etc.) groups *cumulative*. By a complete bigenous table of natality we mean now such a one, which shows the probability for each single year of age of father and mother, and that not only separately, but by combining *each* year of age of one parent with each year of the other.

By this it may also be seen how much wider grows the extent of the table of natality over that of the life-table. Whilst the latter, if proceeding by the single years from birth till to the highest age, is composed of about a hundred, thus for the two sexes, of about two hundred yearly elements, this number rises in the table of natality to 1500–2000, this being the number of combinations for each of the 40–45 productive years of men with each of the 35–40 productive years of women. As the youngest years and the most extreme age combinations occur but very rarely, it is only with observations referring to the population of a great country that we could get reliable probabilities for these outlying cases. The half-million of inhabitants of Budapest furnished only 468 available age combinations. If we could extend these observations to a population of ten millions, the number of available age combinations would rise above a thousand

In order to ascertain the probability of birth for each combination of ages, we need two conditions; (1) that the census should tabulate the age of the married couples by combination of the single years; (2) that at each birth the age of the father and of the mother ought to be reported. If we then proportionate the figures of both sides, we get thus the probability of a birth for each of the combinations of age.

As the age combinations of married couples are thus furnished by the census only at larger intervals, but the age of the parents of the new-born children continually, it is clear that the proportionation of these two figures loses more and more in reliability as the years of births get farther and farther from the year of enumeration. It is therefore reasonable to restrict ourselves to the births of the years closest to the term of the census. Thus, if we would observe the births which occurred in the course of one year, we ought to select those which occurred six months before and six months after the census day; if we could extend our observations to the births of two years, we ought to select the births of one year before and one after the census.

This method of obtaining probabilities by a fraction, the two elements of which are taken from two different sources (the numerator from the registration of births, the denominator from the census), that is from two different populations, touches on a difficulty which we meet with not only in the table of natality, but also in the life-table.

Of course the most complete method of observation would be to observe if we could in a direct way the fertility of the families, that is, if we had before us individually all the families, where the parents are of a certain age and could observe how many children would be born during a year. Since—so far as I know—there exists nowhere any method of registration, under which the births are entered under the heading of the *family*, this individual method of observation is impossible, and has therefore to be replaced by the common method of statistical observation, which instead of families and persons, concerns itself only with figures. We know for instance what is the *number* of the married women of 30 years of age, we know what is the *number* of children born in a given year from mothers of this age, and we assume that these children come from these mothers. But this supposition is only true up to a certain point, and false for the rest. We meet this same difficulty also with the life-tables. Here also it is but an assumption that those who died during the year at a certain age came from those persons who have been enumerated for this age at the beginning of the year, or even some years before. In the case of the life-table, which divides the population only into 200 groups according to age, the error caused by the falsity of the above-mentioned supposition remains more easily hidden. But the table of natality divides a fragment of the population (the married couples) into 2000 groups of age. Thus the fault committed comes easily to light as often as we find children belonging to a certain age combination for which there are registered no parents at all. The census of Budapest, for instance, found not a single family where the father was 23 years of age, and the mother under 16. But during the four years of observation there has been registered—perhaps for an immigrated family—a child of parents at this age combination. Now this child floats parentless in the table of natality; it is a numerator for which the census did not furnish a denominator. But the correction of this defect is impossible.*

We have finally to add some remarks relating to the indication and calculation of age.

When we inquire the age of a population the answer is generally to be understood according to years already completed. If a man says that he is 30 years old, he means that he has lived 30 years and some time more. Therefore I have regarded the age indications as standing between two years of age, for instance, a man of 30 years as being between 30 and 31. Besides this it is clear that the table of natality ought to refer itself to the age of parents, not at the moment of childbirth, but at the time of generation. Thus, if the people standing between 30 and 31 years could be regarded as being in the average at the age of $30\frac{1}{2}$ years, strict precision would require us to register them with the generative age of $29\frac{3}{4}$ years. But, for sake of simplicity, we content ourselves with the above-mentioned simple indication. As *all* the ages ought to be reduced in a similar manner by nine months, the first-mentioned age indications are also comparable amongst themselves, nothing else being required but to change the indication of the column of age in a similar manner, saying instead of 30 to 31 birth age, $29\frac{1}{4}$ to $30\frac{1}{4}$ generative age, and so on.

In the publications of some statistical offices we find here and there data on the age of the mother at time of childbirth. Thus we are here well in possession of one of the factors which would enable us to establish at least monogenous probabilities for the mothers. But what use can we make of that one factor if the other, that is, the number of married wives (classed according to their age) is wanting? Or, if these statistics exist, but, if the wives are grouped according to different limits of age, how is it possible to compare them? Or, if the division of ages is identical, but the two data refer to different periods of time?

And besides, after all such really existing difficulties, if we finally succeed in calculating some natalities, we obtain but half-a-dozen natal probabilities, so that in face of the hundreds and thousands of probabilities contained in a complete table, those poor results cannot claim to be placed on the same level, to be regarded in general as tables of natality. The indifference with which this important question has been treated is proved best by the fact, that even in those few cases where it would be possible to calculate some monogenous probabilities, this calculation has often been quite omitted. As will be seen in the following pages, hitherto not a single specified bigenous, and not even a single specified male table of natality has been produced. What we possess is only one specified table for the female (Berlin), whilst a second one (Sweden) has been finished quite recently (after the publication of this paper) and of which, since it exists only in MS., we give a summary below.

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* Not so with the life-tables. Since, in the countries where registers of population exist, each case of death is noted in the column (or the card) of the enumerated person, it is possible to ascertain the probability of death by observation of the individuals. (See the Author's paper on Life Tables addressed to the International Statistical Congress of Budapest, 1876, published separately, Berlin, 1879 and the individual method there recommended.)

In the following we offer a synopsis of the natal probabilities stated by some statistical offices, respectively calculated by us from the elements furnished in the statistical publications.

Sweden.—The excellent and respectable statistics of this country, which, next to the London death-rates, form the oldest contribution to mortality statistics, and, furthermore, the oldest important observations on smallpox ravages, furnish also the oldest document of natality statistics, beginning as far back as the year 1776, with the observation of the ages of women in childbed. For more than a century the legitimate births have been put together with the illegitimate; but since the year 1868 these two categories are separated one from another. The age was formerly divided into eight quinquennial groups, beginning with the age from 15 to 20 years, and finishing with the groups of above 50 years. With the year 1861 they began to specify the first group by single years. But for a century all these informations could not be used for calculating natal statistics, as the census works did not include the other element, that is, the ages of the married women. As these informations appear for the first time in the census of 1870, and have been continued in 1880 and 1890, it is possible to establish thirteen monogenous (female) probabilities for the two last decenniums. I learn by a letter of M. ELIS SIDENBLADH, the Director of the Swedish Statistical Office, that at present, namely, since 1891, the age of the mothers in childbed is noted by single years, and that thus the office is now enabled to publish monogenous probabilities for each year of the female productive period. Director SIDENBLADH had the extreme kindness to send me a copy of this first attempt, and I naturally hasten to publish this important document, containing thirty-five female probabilities. (See p. 795.)

Finland, so long as it belonged to Sweden, possessed the same statistics. But the age of wives n childbed is noted also subsequently in six quinquennial groups, beginning with the age of 15–20 years and finishing with 45–50. The census furnishing the figures for the same ages of the wives, we are enabled to establish six monogenous female probabilities.

Norway.—The director of the statistical office, Mr. A. N. KIAER, introduced in 1870 the observation of the age at childbirth as well for the mother (–20, –25, ... –50 years) as for the combined paternal age (–20, –25, ... –75 years). These inquiries were continued till 1876, then from 1881 till 1885, and from 1889 onwards. Thus, the one factor wanted for the calculation of natality is elaborated in a most satisfying manner. But as the census work contains only the ages of the husbands and of the wives separately, without giving the mutual age relations, one could establish for Norway only thirteen male and eight female monogenous probabilities. Induced by the wish to utilise his valuable bigenous statistics on births, Mr. KIAER tried to furnish at least an approximate filling up of the void contained in the age tabulation of married couples. Thus, in 1885 he worked out the mutual age combination of one-tenth of the married population, that is of 30,000 married couples, enumerated at the census of Dec. 31, 1875, and that in such a way that he combined the thirteen male and eight female groups of age mentioned above. He obtained thus 104 age combinations. Applying the results obtained, to the whole of the population of Norway, he succeeded thus in knowing, at least approximatively, the age combination for the kingdom, and proportionating to these figures those of the births in 1874, 1875, and 1876, he presented a cumulated bigenous table, containing virtually 104, actually 31, bigenous probabilities. It had been undoubtedly better to extend the birth statistics as far as to 1873, as thus the census ages would represent the average state of the four years observed, whilst at present the birth statistics embrace two years after the census but only one before it. Notwithstanding that, we have to acknowledge in this work a precious first attempt to establish the bigenous probabilities, though only in a cumulative way. But Mr. KIAER informs me that the natal statistics of 1889–1891 will furnish a specified bigenous table for the whole of the population of Norway. As he is occupying himself also with a table of morti-natality, we have thus to expect here one of the most important contributions to the statistics of natality.

The *Danish* statistics contain since 1880 the age of mothers in childbed, divided, as in Sweden, into eight groups, offering thus the possibility of establishing eight monogenous probabilities, which have also been published by the Statistical Office.

That is the whole of the harvest in the vast field of national statistics. But besides that, we found two other countries where the observations—though made for other purposes—allowed us to establish also some birth probabilities.

In *Alsace and Lorraine* they did not investigate the question of natal probabilities, but Professor STIEDA occupied himself in investigating the influence of parental age combinations on the sex of the children, and we can use his preparatory tables also for our work. Professor STIEDA tabulated the number of children born by mothers of 15–19, –24, –29, –34, –40 years with fathers, classified also by quinquenniums up to the fiftieth years of age. But here also the census does not enter into the age combination of married couples, and thus we can deduce from these data only monogenous probabilities: five for the female and six for the male.

In the statistics of *Brunswick* we find since 1876 the age of mothers in childbed tabulated in seven quinquennial groups, offering thus the possibility of seven monogenous probabilities. In the official publication there is calculated only the percental distribution of the number of births over the seven groups of age: the results of such a calculation not only differ from the probability of birth, but give, even for itself, wrong, that is, misleading figures.

Let us now pass to the territory of communal statistics.

In first line I have to mention the most interesting researches of MATTHEWS DUNCAN.* In 1855, when the systematic registration of births in Scotland was established, the schedule in use exacted also the indication of the age of the parents—a circumstance which gives to the registers of that year an extraordinary value, for in subsequent years the use of this schedule was discontinued. Dr. DUNCAN selected now the 16,593 legitimately born children of Edinburgh and Glasgow as the field of operation. He specified the age of the mother by quinquennial periods. The census of 1851 furnished the number of the married women in six quinquenniums, beginning with 15–19 years and finishing with 45–49. Leaving uncounted the extreme cases, where the number of mothers was under a hundred, the work of Dr. DUNCAN furnishes nine available monogenous probabilities for the mothers.

In the city of *Berlin* the zealous interest taken in questions of demology by Dr. R. BOECKH, Director of Communal Statistics, produced a series of important inquiries, and amongst these also a table of natality. This table, it is true, is also only a monogenous (female) one, but it is worked out for each year of age, and since the specified female table of Mr. SIDENBLADH has not yet been published, is to be regarded as the first specified compilation of female probabilities. Besides this, it also takes into consideration the illegitimate natality.† (See p. 866.)

In his excellent statistical works on the city of *Paris*, Dr. BERTILLON tabulates also the ages of the legitimate parents by combining six groups of paternal ages with six of maternal ages, giving thus thirty-six age combinations. But as in the census work the ages of married people are not tabulated in the same bigenous manner, these observations furnish only the possibility of twelve monogenous natalities. Unfortunately the age of the parents are known for less than three-fourths of the births only, for instance, in 1882 for 46,059 births (see 'Annuaire de Paris,' p. 197), whilst the total amounts to 62,581. The natalities obtained falling thus too short from reality and from the probability of other states, to our regret we could not use the data of Paris. It is the same with the *Breslau* statistics of Dr. NEEFE. The age of fathers is tabulated there since 1884 in twelve, that of the mothers in eight groups. In spite of the want of a corresponding tabulation of ages of married couples one could still obtain twenty monogenous probabilities, if unhappily the tabulation of the ages in the census work were not a different one, so that for the present we cannot calculate natal probabilities for this city.*

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* 'Fecundity, Fertility, Sterility, and Allied Topics.' Edinburgh, 1866. This book being out of print, it was, to my great regret, only quite recently that I was able to procure it.

† Dr. BOECKH gives also the number of births occurring in families with mothers under 20, –25, –30 –35, –40, –45, above 45 years, and where the age of the father is higher by 28 and more, by 23–27, 18–22, 13–17, 8–12, 3–7 years, or is lower by 0–2, 3–7, 8–12, 13 and more years. But it is impossible to calculate at this base the probability of any fixed age combination.

Thus we may say that there exists as yet, not only no complete—that is, no specified—bigenous table of natality, but even no specified compilation of the paternal monogenous probabilities.

We may also say that, up to the time when we began the observation of the Budapest natalities, there existed only two attempts at constructing such probabilities—that of KIAER for the kingdom of Norway, and that of BOECKH for the city of Berlin. But we saw that even these do not form a veritable table, the first being bigenous but not specified, the other specified but not bigenous. So far as I know, the Budapest table of natality is thus the first complete—that is, specified and bigenous—one. But, as we learned by the information obtained from M. KIAER at Christiana and M. SIDENBLADH at Stockholm, we may hope that the next year will furnish us a bigenous specified table for Norway, and a male specified one for Sweden. Thus the two Scandinavian kingdoms, to which the world owes already such great thanks for the development of demological knowledge, will also enrich this part of scientific inquiry with two contributions which—in consequence of their referring to the population of two great realms—will merit much more attention than the present attempt, based on the population of a single city only. It will present, then, a special interest to compare the points of parity, the curves of greatest natality, the isogens, &c., with the values obtained from the 468 probabilities established for the city of Budapest—values which, up to now, cannot be deduced even from the 31 bigenous values of the Norway tables, and still less for the still scarcer data of the remaining statistics.

3. *Special Remarks on the Budapest Table of Natality.*

The table of Budapest is based on the schedules introduced by the author in 1888 for each legitimate birth. This schedule is to be filled up by the midwife, and has to be presented to the registrar of births at the moment of registration. The registrar has to transmit this bulletin each week to the municipal office of statistics.†

This blank contains a series of interesting and partly new questions, enabling us to reorganize the whole natal statistics of Budapest in a much wider form.‡ Thus, since that date we have been in a position to investigate the influence of parental age and occupation on fertility, on the vitality of the children, on the sexual proportion, on the number of the still-born, the influence of the duration of marriage on the number of children born, &c. By combining the 46,926 children born in 1889, 1890, 1891, and 1892, and classified according to the age of their parents, with the data furnished by the census of January 1, 1891, on the ages of the 71,800 married couples, we are also enabled to establish the present table of natality.

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* I learn by a letter of Dr. NEEFE, that in the tabulation of the 1890 census this divergence will be avoided, and that we shall thus obtain for the city of Breslau 96 bigenous natalities.

† The registration of births being in the hands of the clergy, the municipal administration could not succeed in adding new questions to these ecclesiastical registers. As may be seen by the author's 'Statistical Year-book of 1870 for the City of Pest' (pp. 9 and 67), twenty years have passed since he made the first attempts to improve the birth registration, in order to reorganize and to enrich the natal statistics. All attempts being unsuccessful, he had finally to accept the compromise, that the information wished for should be collected, not by the clergy, but by the midwife, the former restricting themselves to the collection and transmission of the bulletins.

‡ The first form of this blank has been published in the author's (Hungarian) 'Statistical Monthly, vol. 16, 1880, part 188, and in his paper read December 3, 1888, at the Hungarian Academy of Sciences.

It happens sometimes that the statistical blank is not presented at the time of registration. As it would be inequitable to refuse, purely for the want of the statistical information, the registration and all the important civil rights connected with this act, the clergymen carry out the registration in any case, restricting themselves to informing the statistical office of the cases of omission. It is then the duty of this office to undertake the necessary steps in order to procure the schedules, to secure which fines may even be imposed.

But it is obvious that in such way there will always remain a certain quota of cases where the statistical report cannot be produced. Especially in the beginning, when people were not yet quite favourable to the new institution, the greater part of births escaped statistical elaboration. Thus, in those first four years' observations, on which the present inquiry is based, we obtained 92 per cent. of the registered legitimate births, but, in the following year, 97 per cent. But, even in the best case, this kind of statistics will always show a certain deficiency, caused by the changes or incorrectness of address, by cases of emigration from the city, of death, &c.* As the above-mentioned deficiency of 8 per cent. is not confined to a certain age, but distributed equally over all ages, the natalities obtained are well comparable one to another. But, in comparing the Budapest natalities, as contained in the present paper, to other ones, we ought to keep in memory that the first ones ought to be enlarged by about 8 per cent.

The table of natality of Budapest begins for the male with the age under 20, for the female with that under 16, and lasts up to the oldest ages observed. But, for our present inquiry, we can use only the period of fertility, that is, for the mother, up to about 55, and for the father to about 70 years—presenting thus (51 × 40 =) 2040 age-combinations. However, as, for the great number of cases, the male procreative power is extremely reduced at 60, the female at 50 years, we may finish our observation at the sixtieth year of paternal and at the fiftieth of maternal age. In this case our table embraces virtually (41 × 35 =) 1435 elements of age-combinations. The number of age-combinations for which births were reported amounts to

The improved form is published also in German in his 'Demologische Beiträge' (Berlin, 1892), p. 24. In both places, but especially in vol. 17 (1889) of his 'Monthly' (part 197), are contained also plans for elaborating as well the table of natality as in general the whole newly organized natal statistics of Budapest, of which the table of natality forms but a fragment.

* A corresponding work for Norway obtained the ages of the parents only for 87 per cent. of the births. (See page 108 of the '25 Anniversaire de la Société de Statistique, Paris,' 1886). In the city of Paris also the birth-ages are known for only 75 per cent. of the cases.

1105. But, as the bulk of 72,000 families, if divided into 1400 to 1500 groups of age, furnishes figures too small for the out-lying age-combinations, I left out of account the age-combinations with only 25 or less families,* and also from the combinations with 25 to 99 families—in order to enlarge the curves or to connect separated fragments of them—I admitted only those where the respective probabilities followed nearly the same course as the recognized part of the curve based on at least 100 families.† In such a way the table of natality embraces actually 468 available age-combinations.

Passing now to the results of these observations, I shall deal first with the monogenous natality, and subsequently with the bigenous.

II. Monogenous Natality.

The two principal results are the following :—

1. That the summit of legitimate fertility is reached very soon, so that the decline

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* The place of such probabilities is marked in the Table by an asterisk.

† In order to call the attention of the reader to the smaller value of these admitted observations (embracing 25699 families), I put those into brackets. These admitted age combinations are as follows :—

Age of the mother.	Admitted paternal ages.	
20	—25, 25, 26, 29, 30, 31	= 6
21	—25, 29–31	= 5
22	—25, 33–35	= 4
23	—25, 25, 34, 35	= 4
24	—25, 25, 35, 36	= 4
25	—25, 36–40	= 6
26	—25, 25, 37–40	= 6
27	—25, 25, 26, 38–40	= 6
28	—25, 25–27, 39	= 5
29	26–28, 40–41	= 5
30	41	= 1
31	28, 29, 40–42	= 5
32	28–30, 41, 43–49	= 11
33	28–31, 41, 44–49	= 11
34	28–32, 43, 45–49	= 11
35	30–34, 43, 44, 46–49	= 11
36	35, 44, 47–49	= 5
37	35, 36, 45, 47–52	= 9
38	35–37, 49–54	= 9
39	35, 38, 44, 47–54	= 13
40	33–37, 39, 49, 51–54, 55–60 (1 group), 60–65 (1 group)	= 13
41	38–44, 48–54, 55–60 (1 group), 60–65 (1 group)	= 16
42	36–41, 49, 50, 53, 54, 55–60 (1 group), 60–65 (1 group)	= 12
43	40–44, 46–54, 55–60 (1 group), 60–65 (1 group)	= 16
44	40–44, 49, 50, 52–54, 60–65 (1 group)	= 11
45-50	40, 41, 43–46	= 6
	Total of admitted probabilities	=211
	„ full „	=257
		468

begins, in the case of the male, upwards from 25, and in that of the female, upwards from 18 years.

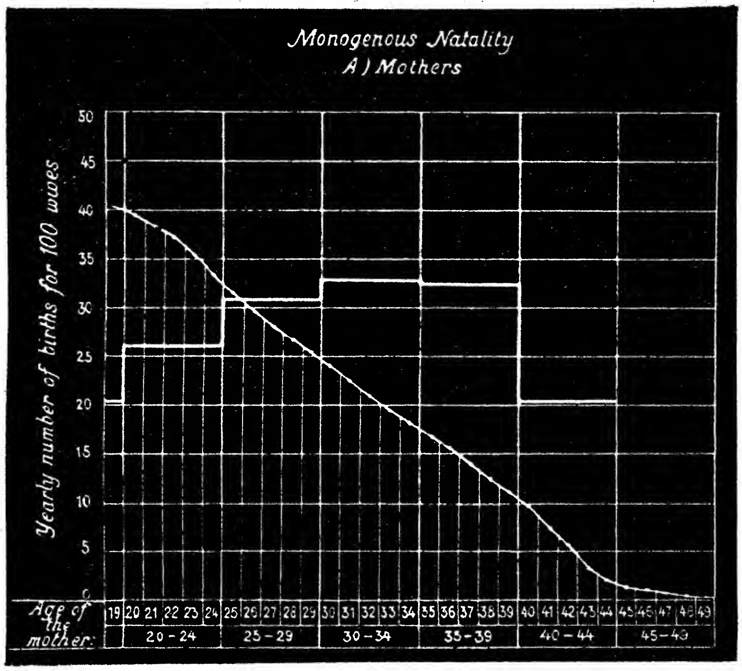
2. That the legitimate fertility does not remain at the same level for many years together, but that it declines *immediately* after reaching the highest point.

These results do not agree with the view of physiology, according to which the generative power should remain for some time at the same height. But we ought not to lose sight of the fact that the legitimate fertility is to be regarded as the resultant of two different forces. The number of children born in a family is, in fact, not a consequence of the physiological power only, but also of the wish to have offspring. In a family where children already exist, the wish for the increase of them is weaker and will be weaker, the greater the number of offspring. Now as the number of children increases with advancing age, the force of the moral factor increases also with the age. Thus passing from younger couples to older ones, we pass at the same time from small to large families, that is from those where the wish for offspring is greater to those in which it is less, where consequently the influence of the moral factor is preponderant over the physiological one. It is to this preponderance that we must attribute the fact that the probability of birth diminishes so rapidly and so regularly with the advancing age.

I shall prove in the following, statistically, that by eliminating the influence of the moral factor, we find fertility distributed in a much more uniform manner over life. But let us first of all recognize the course which the curve follows under the influence of both factors. Though this curve does not represent the course of natural law, it furnishes notwithstanding a picture of the actual state of legitimate fertility, and thus of the chief condition of the multiplication of mankind.

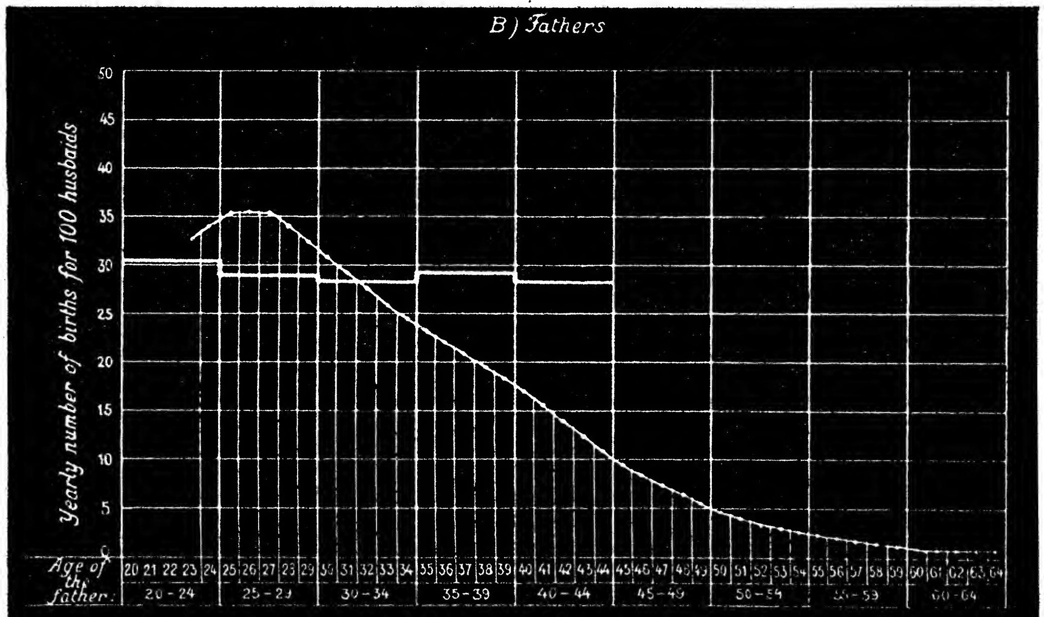
4. *Female Monogenous Natality.*

The census of Budapest found only five wives under 16, and in the course of four years only 6 births have been reported from mothers of that tender age. Twenty-seven wives were between 16 and 17 years and 88 between 17 and 18. Thus the reliable portion of our table of natality begins with the women between 18 and 19. But with this age we find ourselves already at the maximum of *legitimate* fertility. At the age of 18 and 19 years, the annual probability of births is 44·6 and 42·2 per cent.; that is to say, we may suppose that at this age nearly one wife out of two will give life to a child. Beginning with the 20th year, the probability of births declines in a decided manner. At first the decline is but slight, but notwithstanding that, at the age of 25 years the probability amounts to only 31½ per cent., and with 30 years to only 24 per cent. About the 34th year the curve of natality undergoes a stronger declination. Thus with 35 it amounts to only 16 per cent., and five years later to only 8 per cent. After the age of 43, we again observe a still more marked



Monogenous Natality

A) Mothers



B) Fathers

The curve denotes the actual natality (graduated figures) for each year of age, the straight line the initional natality (rough figures) for each quinquennial period of age. (The initional fertility is unknown above 44 years) decline, so that at 45 we find a probability of only 1·4 per cent., that is we may bet 70 to 1 against a child being born at this age. In the following two years the probability sinks to the half of the above-mentioned figure. At the age of 50, only one single birth will occur amongst 1943 families, as 1457 mothers of this age had in four years only three children. But at this point we reached also the extreme limit of maternal legitimate fertility.

During the four years' observation we found, it is true, still four older child-bearing mothers: two at 54, one at 56, and another at 57 years; child-births reported for still higher maternal ages may be regarded as erroneous.*

Thus we see that the legitimate natality declines from the 20th year. As for the youngest ages under 18 years, we do not possess sufficient data, but it is possible that the natality is here weaker than at 18 and 19 years. Let us put together all the cases of mothers of 16 years and under, and we find that 32 families of this size produced in four years 45 children, that is for 100 families and for each one year 35; further that 88 families where the mothers were of 17 years had a probability of 33·8 per cent., whilst those of 18 years, as mentioned above, of 44½ per cent.

We may thus assume *that the legitimate fertility of woman reaches its climax* (*at Budapest*) *at the age of* 18 *and* 19 *years, and declines above and below this age; further, that it arrives at its null-point at* 58.

We reproduce here the results of our monogenous observations, giving both the rough and corrected figures (the mode of correction is explained in the "Appendix," p. 868). Besides these, we have set down the female natalities for Berlin (1887–1890), according to the communication of Dr. BOECKH,† and the same for the Kingdom of Sweden, as communicated to us in manuscript by Mr. SIDENBLADH.

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* In Budapest I tried to verify additionally the highest and therefore improbable age indications, as well for females as for males, by a second inquiry. But as this could take place only after some time had elapsed, many persons could no longer be found in their residences, and thus only a small part of the errors could be corrected in this way. Let us mark on this occasion that MATTHEWS DUNCAN found amongst 16301 child-bearing wives only two at 51, four at 52, and one at 57 years. ANSELL, in his "Families' Statistics," found amongst 4899 cases one mother at the (verified) age of 53 whilst a second case of 59 years wants verification. Professor KÉZMÁRSZKY (Budapest) had the kindness to inform me that during 10 years (1882–92) he delivered, in his lying-in hospital, 8738 women, out of which the oldest cases were: 21 at 41 years, 20 at 40, 17 at 43, 8 at 44, 9 at 45, 2 at 46, 1 at 47. To the kindness of Professor TAUFFER (Budapest) I owe the following data: The oldest mothers in his lying-in hospital were (out of 6260 cases) one woman at 48, two at 47, one at 46, and five at 45; but in the polyclinic institution (out of 2083 cases in 1882–86) *nine* were between 45 and 50 years, one at 51, and one at 54 years. As to the handbooks of Forensic Medicine we find in CASPER-LIMAN one case of 54, and in HOFMANN one of 55 years.

† See 'Statistisches Jahrbuch der Stadt Berlin,' vol. 18, p. 40. We have calculated the average of the yearly data for 1887–90, leaving uncalculated all the data concerning the year 1886, which seems to be still too uncertain; the probabilities of the mothers of 16 and 17 years have also been omitted, the number of those being (according to the census of 1891) only 4 and 9.

ANNUAL Probability of Birth for 100 Married Wives.

Age.	Budapest (1889–1891).		Berlin (1887–1890).	Sweden (1891).*
	Corrected figures.	Rough figures.	Rough figures.	Rough figures.
16–17	36·?	(36·1)	..	(52·7)
17–18	38·?	(33·8)	(52·4)	55·9 maximum
18–19	40·?	44·6 maximum	49·5	50·3
19–20	40·3 maximum	44·2	52·3 maximum	51·8
20–21	39·7	34·9	48·5	54·8
21–22	38·5	41·2	48·1	48·3
22–23	37·2	37·7	43·5	46·5
23–24	35·3	35·3	42·9	42·9
24–25	33·4	32·8	40·1	42·6
25–26	31·6	31·4	37·4	41·1
26–27	30·1	30·0	33·7	38·9
27–28	28·9	28·6	31·0	37·8
28–29	27·6	27·4	28·3	35·8
29–30	25·9	28·7	28·4	35·2
30–31	24·0	21·2	22·7	35·0
31–32	22·3	22·4	22·7	32·2
32–33	20·9	21·3	20·0	31·4
33–34	19·6	19·8	18·7	29·8
34–35	18·2	17·9	17·3	27·7
35–36	17·0	16·1	16·6	27·9
36–37	15·9	16·4	14·3	26·4
37–38	14·7	15·5	12·8	25·9
38–39	13·3	14·8	11·1	25·6
39–40	11·7	14·0	9·8	22·1
40–41	9·8	8·8	6·7	20·3
41–42	7·7	8·3	5·9	16·9
42–43	5·7	4·7	4·2	14·0
43–44	4·0	4·0	2·7	11·3
44–45	2·7	2·4	1·5	7·7
45–46	1·7	1·4	1·0	4·8
46–47	1·0	0·7	0·5	2·8
47–48	0·6	0·8	0·4	1·3
48–49	0·4	0·2	0·2	0·7
49–50	0·2	0·2	0·2	0·2
50–51	0·1	0·05	..	0·1
51–52	0·1	0·20	0·2	..
52–53	..	0·07	..	..
53–54	..	..	..	..
54–55	..	0·06	..	..

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* The natalities for Sweden are calculated on the base of the following figures, where the number of births in 1891 is proportionated to the average of the number of married wives living at the end of 1890 and 1891: 15–16 years, 8 wives and 4 legitimate births; 16–17, 55 and 29; 17–18, 204 and 114; 18–19, 585 and 294; 19–20, 1443 and 748; 20–21, 2658 and 1456; 21–22, 4267 and 2059; 22–23, 5888 and 2736; 23–24, 8049 and 3451; 24–25, 11,108 and 4729; 25–26, 13,816 and 5679; 26–27, 15,970 and 6207; 27–28, 17,620 and 6688; 28–29, 18,625 and 6671; 29–30, 19,164 and 6,749; 30–31, 20,368 and 7120; 31–32, 21,863 and 7041; 32–33, 22,501 and 7070; 33–34, 21,944 and 6533; 34–35, 21,004 and 5811; 35–36, 20,856 and 5808; 36–37, 21,777 and 5751; 37–38, 21,603 and 5596; 38–39, 20,031 and 4523; 39–40, 19,943 and 4412; 40–41, 20,405 and 4134; 41–42, 20,806 and 3508; 42–43, 20,346 and 2853; 43–44, 18,940 and 2142; 44–45, 18,005 and 1383; 45–46, 18,268 and 872; 46–47, 19,102 and 538; 47–48, 18,788 and 250; 48–49, 18,263 and 136; 49–50, 17,610 and 43; 50–51, 17,085 and 22.

We see that the general movement of the curve of Berlin natality is similar to that of the Budapest one. Both show that the climax of legitimate fertility is reached before the twentieth year, and that the decline begins immediately afterwards and goes down in rather regular steps. The same holds also, for the Swedish observations which, moreover, excel by a most remarkable high natality.

In order to obtain the force of increase or decline produced by each year of life, we insert here the percental difference between the natality of a given year, compared to that of the foregoing year. (Where the probability was less than 2 per cent. we did not continue the calculation.) The corrected figures show a rather regular development, whilst the rough figures make frequent bounds.

Age of the mother.	Budapest.		Berlin.	Sweden.
	Corrected figures.	Rough figures.	Rough figures.	Rough figures.
	Per cent.	Per cent.	Per cent.	Per cent.
19–20	+ 0·8	− 0·9	+ 5·7	+ 43·0
20–21	− 1·5	− 21·0	− 7·3	+ 45·8
21–22	− 3·0	+ 15·3	− 0·8	− 11·9
22–23	− 3·4	− 8·5	− 9·6	− 3·7
23–24	− 5·1	− 6·4	− 1·4	− 7·7
24–25	− 5·4	− 7·1	− 6·5	− 0·7
25–26	− 5·4	− 4·3	− 6·7	− 3·5
26–27	− 4·7	− 4·5	− 9·9	− 5·4
27–28	− 4·0	− 4·7	− 8·2	− 2·8
28–29	− 4·5	− 4·2	− 8·7	− 7·1
29–30	− 6·2	+ 4·7	+ 0·4	− 1·7
30–31	− 7·3	− 26·1	− 20·1	− 0·6
31–32	− 7·1	+ 5·6	0	− 8·0
32–33	− 6·3	− 4·9	− 11·9	− 2·5
33–34	− 6·2	− 7·0	− 6·5	− 5·1
34–35	− 7·1	− 9·6	− 7·5	− 7·0
35–36	− 6·6	− 10·1	− 4·0	+ 0·7
36–37	− 6·5	+ 1·9	− 13·9	− 5·4
37–38	− 7·5	− 5·5	− 10·5	− 1·9
38–39	− 9·5	− 23·9	− 13·3	− 1·2
39–40	− 12·0	+ 18·6	− 11·7	− 13·7
40–41	− 16·2	− 37·1	− 31·6	− 8·1
41–42	− 21·4	− 5·7	− 11·9	− 16·7
42–43	− 26·0	− 43·4	− 28·8	− 17·2
43–44	− 29·8	− 14·9	− 35·7	− 19·3
44–45	− 32·5	− 40·0	− 44·4	− 31·9
45–46	− 37·0	− 41·6	..	− 37·7
46–47	..	..	..	− 41·7

I now pass on to introduce the cumulative natalities for quinquennial groups of years. As we have to deal here with greater masses, we find that even the rough figures show a most remarkable regularity. Here we insert, also, those few probabilities which we found scattered in the statistical publications of different countries. By comparing these probabilities with those of Budapest, we have to take into consideration the fact mentioned already, that these latter natalities ought to be raised by about 8 per cent.

We add the following remarks referring to the table of quinquennial natalities:—

Sweden.—The first natalities were published for 1871 in the official publications on the movement of the population in that year. For the period, 1871–80, Mr. V. SUNDBERG published the results at p. 150 of his 'Bidrag till Utverdringsfrägen' (Upsala, 1885), whilst the natalities for 1881–90 are to be found in the official publication for 1890 (vol. 1, p. 14 of the Appendix), and for 1891 in the 'Statistik Tidskrift,' part 100, p. 222 (Stockholm, 1894). The figures quoted below are taken from the manuscript communication of Director SIDENBLADH, and refer to the births of 1891 and the mean population between December 31 of the year 1890 and 1891. The absolute figures are as follows:—15–19 years, 2295 wives and 1189 legitimate births; 20–24 years, 31,970 wives and 14,431 births; 25–29 years, 85,195 wives and 31,974 births; 30–34 years, 107,680 wives and 33,575 births; 35–39 years, 104,210 wives and 26,090 births; 40–45 years, 98,502 wives and 14,020 births; 45–49 years, 92,031 wives and 1839 births.

For *Finland* I choose the last census, that is, of December 31, 1880, published in the 'Suomenmaan Virallinen Tilasto,' vi., 9 (p. 37 of vol. 1), and compared with the figures of the married women, there given, to the mean of the legitimate births of the years 1880 and 1881 (see at pp. 49 and 133 of the 10th vol. in the VIth. series of the above-mentioned official publication).

Norway.—As mentioned before, Mr. KIAER published in 1885 (see his essay in the '25 Anniversaire de la Société de Statisque,' Paris, 1886, p. 107) quinquennial natalities, based on the age-combinations which he observed by tabulating a fragment of the 1875 census cards (that is, 30,000 families). The births refer to the years 1874–76, thus, to two years after, but only one before the census. Taking the tenfold of the figures resulting from the tabulation of the 30,000 families, we obtain the following absolute figures for the whole kingdom: 15–19 years, 1490 wives and 393 births; 20–24 years 15,360 wives and 6611 births; 25–29 years, 32,810 wives and 13,032 births; 30–34 years, 38,330 wives and 13,377 births; 35–39, 35,840 wives and 10,598 births; 40–44, 36,740 wives and 6586 births; 45–49, 35,700 wives and 1452 births.

Mr. KIAER makes on this occasion the just remark that on this base we ought to obtain probabilities inferior to the reality, in consequence of the fact that the couples married in the year of the census unduly enlarge the numerator. He therefore undertakes to correct the figures in an approximate way. Thus, he obtains the following corrected probabilities: 15–19, 41·3 (instead of 26·4); 20–24, 51·9 (43·); 25–29, 43· (39·7); 30–34, 36· (34·9); 35–39, 30· (29·6); 40–44, 18·1 (17·9); 45–49, 3·3 (3·2). Mr. KIAER mentions in his letter that, in consequence of an error in method, the probabilities grew somewhat too high, but that this is counterbalanced in some way by the fact that 13 per cent. of the births are wanting. We have further to mention that the author calculated the probabilities only for those quinquennial groups in which he could observe at least 2000 families.

The probabilities for the married wives of *Denmark* have been calculated by the Danish Statistical Office in the 'Vielser, Foedsler og Dodsfald i aarene,' 1880–89 (Kjöbenhavn, 1893), p. 13, and refer to the legitimate births of 1878–82.

For the calculation of the natality in *Alsace* and *Lorraine*, I used—as mentioned above—the statistical data contained in Mr. WILHELM STIEDA'S 'Das Sexualverhältniss der Geborenen' (Strassburg, 1875, p. 16) and referring to the births of 1872 and 1873. The corresponding figures for the age of married women I took from the census of December 31, 1871, 'Statistische Mittheilungen für Elsass-Lothringen,' vol. 4, p. 42 (Strassburg, 1875). The absolute figures are: 15–19 years, 864 wives and 401 births; 20–24 years, 11,628 wives and 66,576 births; 25–29 years, 30,026 wives and 13,918 births; 30–34 years, 36,149 wives and 14,026 births; 35–39 years, 35,767 wives and 10,191 births. (The number of births is given in the mean of the two years.) It must be remarked that the stillborn are also included.

Brunswick.—The results of the last census (December 31, 1880) are published, Part IV. of the official statistical publications ('Beiträge zur Statistik des Herzogthums Braunschweig'), p. 124. The births are published according to the quinquennial age of the mothers for the year 1880 in the above-quoted 'Beiträge,' vol. IV., p. 41, and for 1881, vol. VIII., p. 25. I calculated the mean of the two years' data and obtained thus the following figures: For the maternal age of 15–19: 215 wives and 125 births; 20–24: 4715 wives and 2138 births; 25–29: 9786 wives and 3393 births; 30–34: 10,351 wives and 2774 births; 35–39: 8981 wives and 1774 births; 40–44: 8767 wives and 710 births; 45–49: 6384 wives and 70 births. It must be remarked that the births embrace also the stillborn.

Edinburgh and Glasgow.—The data are taken from p. 19 of MATTHEWS DUNCAN'S work, quoted before. The calculation is based on the following figures: 15–19 years, 756 wives and 378 births; 20–24 years, 8874 wives and 3309 births; 25–29 years, 14,622 wives and 5065 births; 30–34 years, 14,579 wives and 3872 births; 35-39 years, 11,871 wives and 2421 births; 40-44 years, 10,506 wives and 845 births; 45-49 years, 7537 wives and 96 births.

The source for the quinquennial probabilities for *Berlin* is a manuscript communication, which I owe to the kindness of Dr. BOECKH, the tables published in the Statistical Yearbook of the city furnishing no information on the absolute figures. The respective values are: 15–19 years, 1121 wives and 565 births; 20–24 years, 19,133 wives and 8708 births; 25–29 years, 43,311 wives and 14,546 births; 30–34 years, 49,253 wives and 11,077 births; 35–39 years, 45,205 wives and 6546 births; 40–44 years, 34,923 wives and 2103 births; 45–49 years, 25,394 wives and 187 births; 50–55 years, 17,148 wives and 3 births. The mean probability for the four years I have calculated by the four yearly probabilities, in order to maintain the same proceeding which I applied at the specified probabilities.

COMPARATIVE Table of Female Natality for Quinquennial Groups of Age.

Age of the mother.	Sweden. 1891.	Finland. 1880-81.	Norway. 1874–76.	Denmark. 1880–89.	Alsace and Lorraine. 1872.	Brunswick. 1880–81.	Edinburgh and Glasgow. 1855.	Berlin. 1887–90.	Budapest. 1889–92.	General average.
15–19	**51·81**	37·95	(26·4) 41·3	**71·50** (?)	46·5	**58·1**	**50**	**50·34**	**42·8**	**47·35***
20–24	45·14	**40·59**	**(43)** 51·9	49·37	**56·3**	45·4	41·79	45·55	35·8	45·87
25–29	37·53	35·69	(39·7) 43	40·50	46·3	34·7	34·64	33·60	29·2	37·24
30–34	31·18	32·15	(34·9) 36	31·15	38·8	26·8	26·56	22·50	20·6	29·53
35–39	25·04	26·12	(29·6) 30	22·98	28·2	19·8	20·39	14·50	14·7	22·41
40–44	14·23	15·75	(17·9) 18·1	11·39	..	8·1	8·04	6·03	5·9	9·73
45–49	2	2·68	(3·2) 3·3	1·3	..	1·1	1·27	0·74	0·7	1·45
50–54	..	..	(0·16) 0·16	0	..	..	..	0·02	0·07	0·03

Examining the course of these nine curves of natality in different populations of Central and Northern Europe, we may state, as a general rule, that—at least, in this part of the globe—the prolific power of married women reaches its summit very quickly, even in the first years of marriage, and that afterwards it does not remain for any time at that high level, but bends immediately downwards.† In the cities the female natality seems to be weaker than for the whole population of countries.

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* Without taking into account the natality of Denmark, which seems improbably high.

† Mr. GOEHLERT, to whom we owe several interesting inquiries on natal statistics, dealt also with the

5. *Male Monogenous Natality.*

Our table furnished us during four years only two children sprung from fathers below the age of 20 years—a natural consequence of the scarcity of husbands at this age. Even at the age of 20 years the census found only 7, and in the two following years of age only 20 and 53 husbands. Therefore, if we restrict ourselves to those ages where there have been observed at least a hundred families, our table cannot begin earlier than at the paternal age of 23 years.

For this and the following next year of age the probability of an increase of family amounts to 33 per cent., that is to say, that amongst three families where the father is of 23 or 24 years, there is one which will have a child during a year. With the fathers of 25, the natality rises to 38·9 per cent. But at this early age we have already reached the climax of the male legitimate fertility; each year following depresses the curve of natality. Thus the probability of birth is at 30 years 31·7 per cent.; five years later only 23 per cent. After this the curve tends precipitately downwards; at 40 years it stands already at 15 per cent., that is, we may bet 7 to 1 against a child being born during the year. Ten years afterwards the probability amounts to 4·2 per cent., and at the age of 60 years only to $\frac{9}{10}$ per cent. At the age

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natality of the three Scandinavian kingdoms. He arrived at quite different results. He says ("Die menschliche Reproductionskraft," in Dr. BAUM's 'Wiener Klinik,' Vienna, 1890, p. 251) :—

Age.	Married women.		
	Denmark.	Sweden.	Norway.
under 20 years	1·0	1·0	0·7
from 20–25 ,,	13·9	12·8	11·9
,, 25–30 ,,	26·5	24·7	24·7
,, 30–35 ,,	26·7	26·1	25·3
,, 35–40 ,,	21·0	21·6	21·3
,, 40–45 ,,	9·9	12·0	13·0
above 45 ,,	1·0	1·8	3·1
		100·0	

Mr. GOEHLERT remarks then:

"We learn by these figures that the fertility of married women *rises continually up to the age of* 30 *years*, and goes down afterwards." But these conclusions are erroneous. The figures quoted do not represent the proportion between child-bearing women and women in general (both at the same age), but are only percental values of the first, the total of the child-bearing women being equal to 100. It is the same error which we pointed out some pages before for the Brunswick statistics.

of 65 years the probability to become a father is a minimum ($\frac{1}{3}$ per cent.), and at 69 years only one out of 500 husbands will have a child.

The oldest fathers are: at 71 years three, and at 76 one. But the data respecting the oldest fathers are to be accepted in general with still greater hesitation than those of mothers. The doubtfulness of these data may be judged by the fact that the reported fertility of the fathers above 66 is an increasing one! But let us add that physiology admits conservation of male generative power till 80 years.

The facts we have mentioned lead us to suppose that this power is not fully developed before the age of 25. This supposition finds support in the observation of the natality shown at younger ages. If in consequence of the insufficiency of the data we summarize all the younger husbands into two groups, we find that those under 22 years have a natality of $33\frac{1}{3}$ per cent., those of 22 years of 26·9, whilst the following three years of age show an increase.

We may thus assume *that the male generative power reaches its climax in married life at the* 25*th year, that it declines above and below this age, and that it arrives at its null-point at about* 70 *years.*

As before, we reproduce here the rough and the corrected figures of the monogenous observations for each year of life. As there are nowhere to be found corresponding observations, we must restrict ourselves to our own results. We add at the same time the degree of yearly change, expressed in per cents. of the natality of the foregoing year.

ANNUAL Natality for 100 Husbands.

Age.	Corrected figures.	Rough figures.
23–24 years	33	33·3
24–25 ,,	34·4	33·9 yearly change = + 1·8 per cent.
25–26 ,,	35·0 yearly change = + 1·7 per cent.	38·9 ,, +14·8 ,,
26–27 ,,	35·3 ,, + 0·9 ,,	36·4 ,, − 6·4 ,,
27–28 ,,	35·1 ,, − 0·6 ,,	34·8 ,, − 4·4 ,,
28–29 ,,	34·3 ,, − 2·3 ,,	34·1 ,, − 2·0 ,,
29–30 ,,	32·9 ,, − 4·1 ,,	36·6 ,, + 7·3 ,,
30–31 ,,	31·1 ,, − 5·5 ,,	29·5 ,, −19·4 ,,
31–32 ,,	29·3 ,, − 5·8 ,,	27·6 ,, − 6·4 ,,
32–33 ,,	27·6 ,, − 5·8 ,,	29·2 ,, + 5·8 ,,
33–34 ,,	26·1 ,, − 5·4 ,,	25·1 ,, −14·0 ,,
34–35 ,,	24·6 ,, − 5·7 ,,	23·9 ,, − 4·8 ,,
35–36 ,,	23·4 ,, − 4·9 ,,	23·9 ,, 0 ,,
36–37 ,,	22·1 ,, − 5·5 ,,	22·0 ,, − 7·9 ,,
37–38 ,,	20·8 ,, − 5·9 ,,	21·5 ,, − 2·3 ,,
38–39 ,,	19·5 ,, − 6·2 ,,	17·8 ,, −17·2 ,,
39–40 ,,	18·2 ,, − 6·7 ,,	20·7 ,, +16·3 ,,
40–41 ,,	16·7 ,, − 8·2 ,,	15·3 ,, −26·1 ,,
41–42 ,,	15·3 ,, − 8·4 ,,	15·3 ,, 0 ,,
42–43 ,,	13·8 ,, − 9·8 ,,	14·6 ,, − 4·6 ,,
43–44 ,,	12·3 ,, −10·9 ,,	11·8 ,, −19·2 ,,
44–45 ,,	10·9 ,, −11·4 ,,	10·9 ,, − 7·6 ,,
45–46 ,,	9·5 ,, −12·8 ,,	9·0 ,, −17·4 ,,
46–47 ,,	8·3 ,, −12·6 ,,	7·5 ,, −16·7 ,,
47–48 ,,	7·2 ,, −13·3 ,,	7·9 ,, + 5·3 ,,
48–49 ,,	6·2 ,, −13·9 ,,	5·7 ,, −27·8 ,,
49–50 ,,	5·4 ,, −12·9 ,,	5·2 ,, − 8·8 ,,
50–51 ,,	4·7 ,, −12·9 ,,	4·2 ,, −19·2 ,,
51–52 ,,	4·1 ,, −12·9 ,,	4·1 ,, −23·8 ,,
52–53 ,,	3·5 ,, −14·6 ,,	3·4 ,, −17·1 ,,
53–54 ,,	3·0 ,, −14·3 ,,	3·2 ,, − 5·9 ,,
54–55 ,,	2·6 ,, −13·3 ,,	2·2 ,, −31·2 ,,
55–56 ,,	2·2 ,, −15·4 ,,	2·1 ,, − 4·5 ,,
56–57 ,,	1·9	2·1 ,, 0 ,,
57–58 ,,	1·6	1·2
58–59 ,,	1·4	1·4
59–60 ,,	1·2	1·2
60–61 ,,	1·0	0·9
61–62 ,,	0·8	0·9
62–63 ,,	0·7	0·6
63–64 ,,	0·6	0·7
64–65 ,,	0·5	0·3

The quinquennial probabilities follow below, accompanied by those two single fragments of male natalities which statistical literature offers, that is, of the Kingdom of Norway and of Alsace and Lorraine. We learn by this comparison that the male inhabitants of the city show a considerably weaker natality than those in the country.

COMPARATIVE Table of Male Natality at the following Quinquennial Groups of Age.

Age of the father.	Norway. (1874–1876.)	Alsace-Lorraine. (1872–1873.)	Budapest. (1889–1892.)
15–19 years	(18·2) 27	21·2	?
20–24 "	(38·9) 49·8	61·7	33·3
25–29 "	(38·6) 43·6	53·3	35·8
30–34 "	(35·8) 37·7	44·2	27·1
35–39 "	(29·5) 30·3	32·5	21·1
40–44 "	(22·1) 22·5	20·9	13·8
45–49 "	(12·6) 12·8	10·9	7·2
50–54 "	(6·2) 6·3	..	3·5
55–59 "	(2·51) 2·6	..	1·7
60–64 "	(1·25) 1·33	..	0·7
65–69 "	(0·61) 0·66	..	0·4
70–74 "	(0·30) 0·32	..	0·2

The sources of both calculations have been indicated before. We restrict ourselves therefore to mentioning here the absolute figures.

Norway.—Rough figures: under 20 years, 360 husbands and 65 births; 20–24 years, 7140 husbands and 2777 births; 25–29 years, 25,090 husbands and 9690 births; 30–34 years, 30,529 husbands and 12,610 births; 35–39 years, 35,550 husbands and 10,974 births; 40–44 years, 38,230 husbands and 8462 births; 45–49 years, 38,220 husbands and 4801 births; 50–54 years, 35,050 husbands and 2176 births; 55–59 years, 27,680 husbands and 695 births; 60–64 years, 18,840 husbands and 235 births; 65–69 years, 12,760 husbands and 78 births; 70–74 years, 8990 husbands and 27 births.

As mentioned above Mr. KIAER corrected the figures, eliminating the couples married since less than nine months; the probabilities deduced by the rough figures are put in the above Table into brackets.

Alsace-Lorraine.—15–19 years, 79 husbands and 21 births; 20–24 years, 3531 husbands and 2178 births; 25–29 years, 18,603 husbands and 9914 births; 30–34 years, 32,025 husbands and 14,143 births; 35–39 years, 34,493 husbands and 11,559 births; 40–44 years, 33,484 husbands and 6995 births; 45–49 years, 30,675 husbands and 3399 births. The figures of births represent the mean of the cases occurring in 1872 and 1873.

6. *Parallelism and Divergence in Female and Male Natality.*

The female legitimate natality begins, so to say, immediately with its maximum, and tends thence immediately downwards, finishing at the age of about 50–55 years. The male natality shows first an increase, but bends also downwards immediately after the summit, reaching its null-point at the age of 70–75 years about. Besides that, we saw that at the beginning of the procreative period the natality of the female stands at a higher degree than that of the male.

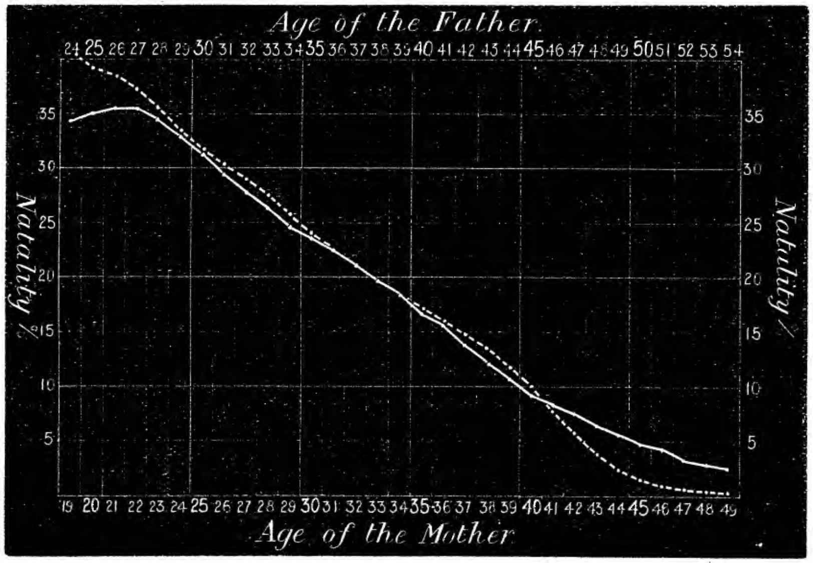
In consequence of these conditions—higher beginning and earlier finishing of the female natality—the course of the two curves must be such that they show the greatest divergence in the earliest period of fecundity, the female curve standing there much higher; the two curves subsequently approach more and more, till at a certain point of life they cross one another. After this point of intersection the female curve will be the lower, whilst at the highest ages, where female fecundity has already expired, the weakened male fertility totters lonely towards its term of extinction.

Comparing the course of both curves we find that the point of intersection is marked at the age of about 45 years of the husband and about 40 of the wife. But at the same time we see that we ought not to speak of a point but of a space of intersection, as for a long period of life the natality of the two parents stands so close one to another that it may be regarded as the same. And, further, we learn by the comparison of the two curves that for a still longer period of life the male natality reaches the height of the female nearly at the same distance of time, that is, about five years later. Thus the points of parity are reached by the two parents at the following age :—

34–33	per cent.	by the mother at	24,	by the father at	28 and 29	years;	mean distance	4½	years.
32–31	,,	,,	25,	,,	30	,,	,,	5	,,
30	,,	,,	26,	,,	31	,,	,,	5	,,
29–28	,,	,,	27 and 28,	,,	32	,,	,,	4½	,,
27–26	,,	,,	29,	,,	33	,,	,,	4	,,
25–24	,,	,,	30,	,,	34	,,	,,	4	,,
22	,,	,,	31,	,,	36	,,	,,	5	,,
21	,,	,,	32,	,,	37	,,	,,	5	,,
20	,,	,,	33,	,,	38	,,	,,	5	,,
19–18	,,	,,	34,	,,	39	,,	,,	5	,,
17	,,	,,	35,	,,	40	,,	,,	5	,,
16–15	,,	,,	36 and 37,	,,	41	,,	,,	4½	,,
14–13	,,	,,	38,	,,	42	,,	,,	4	,,
12	,,	,,	39,	,,	43	,,	,,	4	,,
11–10	,,	,,	40 and 41,	,,	44 and 45	,,	,,	4	,,
8	,,	,,	42,	,,	46	,,	,,	4	,,
7–6	,,	,,	43,	,,	47 and 48	,,	,,	4½	,,
5–4	,,	,,	44,	,,	49, 50, and 51		,,	6	,,
			General average of the parity distance					4·61	years.

To make this coincidence easier of detection by the eye, we have used in the following diagram the same place of the abscissa for a given age of the mother and a five years higher age of the father.

Parallelism of the Female and of the Male Natality.



We see by this diagram that this parallelism is maintained for a period of life embracing nearly thirty years, that is, about the whole of the important part of the productive period.

But here we must object that this parallelism need not be the necessary effect of a natural law, of later ripening of the male, but that it may be caused also by the circumstance that fertility is greatest with new married couples, and that the most usual age-distance of wedding couples may be 4–5 years. This objection being worthy of consideration, we will investigate this secondary question.

There are two ways of stating the average age-distance of married couples, viz., by the age statistics of marriages contracted in a long lapse of time, or by means of the census referring to the whole number of couples. Both observations are made at the Office of Municipal Statistics. Without entering into the somewhat circumstantial details, I give here the final results.

The Census results are to be found in the Table of Natality, containing for each year of the husband's age the single years of age of the respective wives. Extracting and uniting all the cases where the husband was 1, 2, 3 . . . 55 years older, or 1, 2, 3 . . . 36 years younger than the wife—these distances including the extremes of the enumerated cases—we find then, by multiplying the number of husbands by the figure of their age-distance:

56,587 husbands who are . . . . . (+) 423,267 years older,
5,124 „ „ at the same age and
10,070 „ „ . . . . (−) 44,154 „ younger

= 71,781* husbands presenting a *plus* of . 379,113 years over the age of their wives; the mean age-difference for the husbands is thus + 5·28 years.

As for the mean age of the betrothed, the author has it stated for several decenniums in the statistics of the Movement of Population of Budapest. Calculating the general average distance deduced from the marriages from 1858 till 1870,† and from 1876 till 1893, we find that this value is nearly identical with that we stated above. The average age was :

In the first period, for the bridegroom, 28·95, for the bride, 24·51 years; distance = + 4·44 years.
In the second period,‡ „ 31·26, „ 26·86 „ „ = + 4·40 „

The mean parity-distance of natality being—as shown before—4·61 years, the two values are fairly coincident, so that this parity could be also explained simply by the mean age-difference of marrying couples. The question would be easier resolved if we could compare the same two statistical values in other countries. Unfortunately there exists nowhere a specified table of bigenous natality, and even a cumulated one only for Norway. For fault of better material we shall, however, try to make this statistical experiment with the Norway data, though it may be foreseen that, on the base of quinquennial age groups, the results cannot be sufficiently sharp ones.

The Norway table offering only eight probabilities for the female, it would be of no use to establish half a hundred of degrees of natality; we must restrict ourselves to putting these values together into groups of 5 per cent. degree each. The parities which can be established are now as follows :—

Above	45	per cent. reached	by the	mother at	20–24,	by the	father at	20–24,	parity-distance	= 0
„	44–40	„	„	„	25–29,	„	„	25–29,	„	= 0
„	39–35	„	„	„	30–34,	„	„	30–34,	„	= 0
„	34–30	„	„	„	35–39,	„	„	35–39,	„	= 0
„	29–25	„	„	„	..	„	„	15–20		
„	20–24	„	„	„	..	„	„	40–44		
„	19–15	„	„	„	40–44					

Thus at the different periods of life the fertility of the two sexes is the same, that is, falls in both sexes into the same quinquenniums, or in other words the parity-distance changes in Norway between 0 and 5 years, makes thus in the average ± 2½ years. Now, if repeating the same quinquennial calculation for Budapest, we find that, even at this case, the parity-distance of 5 years is maintained, the following probabilities being reached :

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* The total of the Table of Natality makes 71,800; the difference of 9 is caused by the extreme classes (like "above" 90, "under" 16, where the mean age could not be stated).

† For this period, referring only to the city of Pest, see the author's 'Statistisches Jahrbuch' (Berlin, 1873), page 41.

‡ See the author's 'Statistical Monthly,' vol. 22, Part 251.

44–40	per cent.	by the female at	15–19	years,	by the male	..		
39–35	,,	,,	20–24	,,	,,	25–29,	distance	=5 years.
34–30	,,	,,	..	,,	,,	20–24,	,,	
29–25	,,	,,	25–29	,,	,,	30–34,	,,	=5 ,,
24–20	,,	,,	30–34	,,	,,	35–39,	,,	=5 ,,
19–15	,,							
14–10	,,	,,	35–39	,,	,,	40–44,	,,	=5 ,,
5–9	,,	,,	40–44	,,	,,	45–49,	,,	=5 ,,
0–5	,,	,,	45–49	,,	,,	50–54,	,,	=5 ,,

Now the question is, what is the difference of ages at marriage in Norway ? If there also, this difference should coincide with the parity-distance, that is, should amount to ± 2½ years, this would furnish a new instance against supposing the influence of a physiological law.

Undertaking (on the base of M. KIAER's Table 25, 'Anniversaire,' p. 112) this calculation for Norway, by the same method as for Budapest, I found

138,609	older husbands	representing a	plus of	1,200,008	years	
89,168	equi-aged	,,				
61,777	younger	,,	,, minus	472,785	,,	
289,554	husbands	,,	plus of	727,223	,,	= 2·51 years

in the average. *Thus the probability is against the supposition of a physiological law*, and the fact that at Budapest the males reach the same natality five years later than females may be regarded only as a mechanical effect of the social causes which rule the age combinations of the marrying couples.

7. *Difference between the Actual and the Physiological Natality.*

As mentioned before, the legitimate natality is to be regarded as the resultant of two distinct forces : the physiological and the moral moment. To ascertain the isolated effect of the physiological factor, we ought to look for such cases where the moral check is nought, or the least possible. No doubt that this check is the strongest where the number of children is greatest, and the weakest where there are no children at all. Thus, we might suppose that it is with the new married couples that the effect of the moral restraint is nearly nought, and where, therefore, the force of the physiological moment could be most readily recognized. Unfortunately, experience has not quite realized this supposition, not at least for the youngest ages.

The table of natality containing no indication relating to the duration of marriages, it is impossible to deduce from these the natality of new-married couples. But I could have recourse, in this respect, to the household schedules of the census, on the occasion of which each family was questioned about the duration of marriage, and about the number of children born. Thus I set aside the schedules of all the couples who had been reported as married since one year, and looked then for the number of children there born. The number of these couples was 4382.

But before entering into the respective results, we have to make some restrictions relating to the signification of this new kind of natal probability, designed to represent the degree of physiological fertility.

First, it is obvious that these probabilities are also partly influenced by moral moments, as the young wives do not willingly pass from girlhood immediately to the more anxious state of motherhood. Further, we have to take into consideration the circumstance, that in the census schedule the duration of marriage has been indicated in full years. Consequently, the marriages reported to have lasted one year, may include as well those of only some months' standing as those which have lasted between one to two years. But even if we had to do only with marriages existing strictly one year, that is twelve months, we ought to consider that the births of these marriages relate to a generative period of only three months, whilst those of the two-year-old marriages represent the generative period of fifteen months.*

Under such circumstances there are plenty of objections against regarding this initial natality of the new-married couples as the right measure of the force of the physiological factor. But as we possess no other information upon this important point, it may be quite worth while to enter into an analysis of this curve, and to inquire how far it declines from that of the actual natality.

The material being but meagre, we have to restrict ourselves to quinquennial periods of age. We learn by the following figures that in the more natural course of things which prevails with new-married couples, it is but in a later period of age that generative power reaches its climax ; further, that this power stays for a longer time at the same level, that the decline occurs in a more advanced age, and is a more rapid one.

In the case of the new-married couples, the climax of the female generative power is reached between 30 and 35 years ; to judge from the observations relating to single years of age, one might suppose that this climax falls about the period from 28 to 33 years.

As for the male, the generative power stays between 20 and 40 years at about the same level.

I know no other observations on this subject except the most valuable investigations of MATTHEWS DUNCAN, whose attention the importance of the initial fertility did not escape. He observed in his book above mentioned, the number of births which occurred in 1855 at Edinburgh and Glasgow during the first and the second year of marriage. These observations, which refer only to mothers, coincide with our own, so far as to show that the new-married couples attain the climax of fertility rather later than the *average* of all the married couples together; further that the fertility remains a longer time at the same level, and declines at a higher age and in a more rapid way. But as for the time in which the climax is reached, the Scotch observations show an earlier term.

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* It would consequently be preferable to divide the marriages according to their duration, into such of under 9 months, 9–18, 18–27, &c., months.

Here follow the respective figures.

Initial Natality.

Age.	Budapest (in the first year of marriage).		Edinburgh and Glasgow (in the first two years of marriage).
	Mothers.	Fathers.	Only mothers.
Under 20 years.	20·4	?	43·7
20–24	26·7	30·4	**90·5**
25–29	30·9	28·	75·8
30–34	**32·9**	27·	62·9
35–39	32·7	**28·7**	41·
40–44	20·4	27·2	15·5
45–49	(26·2)	?	(4·3)

If we insert the curves of general (actual) and of initial (physiological) natality on the same system of co-ordinates, we get for each period of life two different values. The difference between these two points ought to give theoretically the measure of the moral restraint. But in reality this difference is unfortunately also influenced by the above-mentioned causes. It is probably in consequence of this that the physiological natality of the youngest ages shows the striking phenomenon of falling short of the actual one. At first I was disposed to believe that some mistake was involved, either in the inquiry or in the working out of my own material. But when I learned afterwards that the observations of M. Duncan led to the same strange result, I was led in some degree to acquiesce in my own ones, and to hope that further observations even corroborate them.

But for the higher age the initial fertility stands always higher than the general one. The distance (the few cases of generative exhaustion excepted) may be admitted as an approximate measure of that much-discussed moral restraint which, since Malthus has so much occupied economists, demographers, and statesmen, but still without their succeeding in finding a statistical evaluation of this moment.

With advancing age the difference between the curves of the general and of the initial natality—which we may regard as approaching as near as possible to the physiological—becomes continually greater, and the effect of moral restraint (combined always with the effects of exhaustion) assumes dimensions surpassing all imagination. With mothers between 30 and 35 this moral restraint reduces the fecundity from 100 to 78, with such between 35 and 40 years to 45 per cent., that is, the depression amounts to more than half. But at ages over 40 years, the natural fertility of wives is almost entirely suppressed by these factors. For the first moment one may perhaps doubt the reliability of the statistical fact, that whilst out of 100 new-married women at the age 40–45, there are still 29 who will have a child during a year, we find amongst 100 who married earlier, only 6; or that at the age 45–50, while the physiological probability is still of 260 births for 1000 women, the probability as shown by the Tables is actually only 7! But if we take into account with how much anxiety wives at this age—at which they often become grandmothers—regard the event of childbirth, we may look upon the above statement as trustworthy.

The moral restraint exercises its influence also on the natality of the fathers, though the effect of it is weaker than in the case of mothers. At the age of 35–40 we find against the physiological natality of 100 an actual of 73, and at the age 40–45 a natality of 50 per cent.

III. BIGENOUS NATALITY.

8. *Natality According to the Age Combination of Both Parents.*

Passing to the enquiry into the natal probability according to the age combination of both parents, we find ourselves face to face with such an overwhelming quantity of facts, that it is impossible to deal with them one by one. Up to this point we had to deal with the course of two curves only, one of the mothers and the other of the fathers. But each single element of these curves is really an average of most different probabilities according to the various ages of the other parent.

If we resolve these average natalities into as many elements as the years of age of the other parent, we ought to divide each figure of female monogenous natality into about 40 constitutive parts (according to the about 40 years included in the period of male fertility), and each figure of the male monogenous natality into about 35 parts (according to the age of the mothers). Thus, instead of the two monogenous curves, we should arrive at about 75 bigenous curves. The Table of Natality inserted here as No. I. contains the whole rough material, that is, the number of families living in the productive period of life and observed during the four years 1889–92, and the number of children during the same time. Table II. contains the rough probabilities of birth for that part of the age combinations which offered sufficient cases for the calculating of serviceable probabilities. The adjustment of these rough figures has been finished by Dr. E. BLASCHKE, *Docent* at the Vienna University (see the Appendix, p. 868), and the corrected figures are published in Table III.

The tabular part of this enquiry contains thus all the requisite data with greatest possible specification. But as for the textual interpretation of these tables, we ought to restrain ourselves. We mentioned before that these tables lead to 75 bigenous curves. To interpret each of these in the same manner as we did before with the two monogenous curves, would form a task too heavy and too tiring both for the author and for the reader. Besides this we have to regard the circumstance that my own observations comprise the births of only half a million of inhabitants. This population is great enough to show the practicability of the method followed, the general character of the results to be obtained and the real state of things for the most general age combinations, but is too small to furnish available results for the rarer ones.*

On this account I shall restrict myself to pointing out in the following lines only some of the more remarkable phases in the course of the bigenous curves, adding a coloured graphical table ("Tabellogram," Plate 30), which allows a synoptical view of the development and of the mutual interlacement of the 75 curves. The probabilities quoted here are based on the rough figures. (As for the reasons why the adjustment of these figures has been omitted in this chapter, see the Appendix.)

For simplicity's sake we shall present first—and only for the determining part of the period of fecundity—the changes which female natality undergoes, according to the quinquennial advancement of the father's age, without entering into a yearly specification of this latter factor. Then we shall investigate the counterpart, that is, the change which the natality for each paternal age undergoes, according to the quinquennial advancement of maternal age. Thus Table A (see p. 833) contains the combination of specified maternal and cumulated paternal age, Table B that of specified paternal and cumulated maternal age. According to which sex we regard as determining and which as determined, that is according as we wish to learn which change the advancing paternal age produces on the fertility of a given maternal age or *vice versâ*, both tables lead to two different systems of *curves*;† but their *numerical* representation does not require special tables. The

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* To diffuse sufficient light on the whole extent of this vast question, we need similar observations referring to the population of an entire country with 15–20 millions of inhabitants. Up to now the only countries where such observations would be possible are Scotland and Norway. As in Scotland, in the one year 1855, the age of the parents was noted at each birth, it would be a great gain if someone would undertake the task of utilizing these most important data buried in the archives of the Registrar-General of Scotland. As mentioned before, we may expect in the near future, such enquiries concerning the population of Norway also.

† Thus the author reproduced, in the 'Atlas of Natality-Diagrams,' presented to the Royal Society, tables where the specified age of father is combined (1) with the cumulated age and (2) with the specified age of mothers (see the Tabellogram), and further, where the cumulated age of the fathers is combined (3) with the maternal cumulated age (see the quinquennial recapitulation of the Tabellogram)

TABLE I.—The Table of Natality.*

Age of the fathers.	Age of the mothers, under 20 years.															Total under 20 years.		
	Under 16 years.			16–17.			17–18.			18–19.			19–20.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
Under 20 years .	..	..	..	..	..	..	..	..	..	..	..	..	1	0	*	1	0	*
20–21	..	..	..	..	..	..	..	..	..	..	1	..	1	0	*	1	1	*
21–22	..	..	..	..	1	..	..	1	..	2	0	*	1	1	*	3	3	*
22–23	1	0	*	..	..	..	2	0	*	..	8	..	..	4	..	3	12	*
23–24	..	1	..	..	2	..	5	5	*	5	19	*	12	13	*	22	40	*
24–25	..	..	..	..	7	..	8	13	*	16	32	*	25	42	(42·0)	49	94	(47·9)
20–24	1	1	*	..	10	..	15	19	*	23	60	*	39	60	(38·5)	78	150	(48·1)
25–26	1	1	*	2	4	*	15	16	*	27	47	(43·5)	37	93	(62·8)	82	161	(49·1)
26–27	1	1	*	3	3	*	14	15	*	33	70	(53·0)	48	91	(47·4)	99	180	(45·5)
27–28	..	..	..	3	3	*	11	13	*	40	50	(31·3)	51	109	(53·4)	105	175	(41·7)
28–29	1	1	*	5	5	*	5	15	*	31	44	(35·5)	38	83	(54·6)	80	148	(46·2)
29–30	..	..	..	5	1	*	4	12	*	18	40	*	63	89	(35·3)	90	142	(39·4)
25–29	3	3	*	18	16	*	49	71	(36·2)	149	251	42·1	237	465	42·1	456	806	44·2
30–31	..	..	..	2	5	*	6	9	*	20	27	*	42	57	(33·9)	70	95	(33·9)
31–32	..	..	..	..	..	..	5	7	*	11	26	*	22	35	*	38	68	(44·7)
32–33	1	0	*	1	2	*	1	4	*	7	18	*	20	34	*	30	58	(48·3)
33–34	..	1	..	..	1	..	3	5	*	9	16	*	22	26	*	34	49	(36·0)
34–35	..	..	..	1	0	*	4	1	*	2	11	*	8	20	*	15	32	*
30–34	1	1	*	4	8	*	19	26	*	49	95	(48·5)	114	172	37·7	187	302	40·4

* The figures in brackets are deduced from less than 100 families. Where the number of families was less than 25, no probability having been calculated, the respective place is marked by an asterisk.

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, under 20 years (continued).															Total under 20 years.		
	Under 16 years.			16–17.			17–18.			18–19.			19–20.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
35–36	..	..	..	1	1	*	1	1	*	2	5	*	8	13	*	12	20	*
36–37	..	..	..	2	2	*	..	1	..	3	7	*	6	10	*	11	20	*
37–38	..	..	..	1	1	*	2	0	*	5	1	*	4	7	*	12	9	*
38–39	..	..	..	1	0	*	..	1	..	1	1	*	5	7	*	7	9	*
39–40	..	..	..	..	1	..	1	0	*	1	2	*	1	3	*	3	6	*
35–39	..	..	..	5	5	*	4	3	*	12	16	*	24	40	*	45	64	(35·6)
40–41	..	..	..	..	..	..	..	..	..	2	1	*	1	2	*	3	3	*
41–42	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	2	..
42–43	..	..	..	..	..	..	..	..	..	2	2	*	..	2	..	2	4	*
43–44	..	..	..	..	..	..	..	..	..	..	1	..	2	1	*	2	2	*
44–45	..	..	..	..	..	..	..	..	..	..	..	..	1	1	*	1	1	*
40–44	..	1	..	..	..	..	..	..	..	4	4	*	4	7	*	8	12	*
45–46	..	..	..	..	..	..	1	0	*	..	2	..	1	1	*	2	3	*
46–47	..	..	..	..	..	..	..	..	..	1	0	*	1	0	*	2	0	*
45–49	..	..	..	..	..	..	1	0	*	1	2	*	2	1	*	4	3	*
51–52	..	..	..	..	..	..	..	..	..	1	0	*	..	..	..	1	0	*
50–54	..	..	..	..	..	..	..	..	..	1	0	*	..	..	..	1	0	*
57–58	..	..	..	..	..	..	..	..	..	1	0	*	..	..	..	1	0	*
59–60	..	..	..	..	..	..	..	..	..	..	..	..	1	1	*	1	1	*
55–59	..	..	..	..	..	..	..	..	..	1	0	*	1	1	*	2	1	*
Above 60 years .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total, general	5	6	*	27	39	(36·1)	88	119	(33·8)	240	428	44·6	422	746	44·2	782	1338	42·8

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 20–24, years.															Total, 20–24 years.		
	20–21.			21–22.			22–23.			23–24.			24–25.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
Under 20 years	..	..	..	..	..	..	1	1	*	..	..	..	..	..	..	1	1	*
20–21	1	3	*	1	2	*	..	2	..	..	..	..	1	2	*	3	9	*
21–22	2	0	*	4	5	*	4	2	*	1	4	*	1	1	*	12	12	*
22–23	8	8	*	6	11	*	7	8	*	7	4	*	7	4	*	35	35	(24·9)
23–24	16	29	*	13	29	*	16	19	*	25	22	(22·0)	13	16	*	83	115	(34·6)
24–25	46	74	(40·2)	45	88	(48·9)	67	91	(34·0)	45	83	(46·1)	84	81	(24·1)	287	417	36·3
20–24	73	114	(39·0)	69	135	(48·9)	94	122	(32·4)	78	113	(36·2)	106	104	27·5	420	588	35·0
25–26	89	122	(34·3)	79	157	(49·7)	106	186	43·9	79	150	(47·5)	88	144	(40·9)	441	759	43·0
26–27	93	185	(49·7)	101	189	46·8	138	249	45·1	129	204	39·5	160	216	33·8	621	1043	42·0
27–28	111	165	37·2	123	205	41·7	152	242	39·8	150	243	40·5	168	258	38·4	704	1113	39·5
28–29	117	162	34·6	116	190	40·7	192	258	33·6	148	271	45·8	216	319	36·9	789	1200	38·0
29–30	82	117	(35·7)	78	167	(53·5)	130	239	46·0	164	251	38·3	170	290	42·6	624	1064	42·6
25–29	492	751	38·2	497	908	45·7	718	1174	40·9	670	1119	41·8	802	1227	38·2	3179	5179	40·7
30–31	106	130	30·7	86	132	(38·4)	142	209	36·8	172	231	33·6	226	295	32·6	732	997	34·0
31–32	64	63	(24·6)	79	120	(38·0)	118	156	33 0	123	178	36·2	174	214	30·7	558	731	32·8
32–33	44	66	(37·5)	62	85	(34·3)	114	184	40·4	102	156	38·2	163	235	36·0	485	726	37·4
33–34	44	50	(28·4)	55	79	(35·9)	79	117	(37·0)	120	135	28·1	145	146	25·2	443	527	29·7
34–35	24	29	*	41	55	(33·5)	65	84	(32·3)	72	79	(27·4)	119	139	29·2	321	386	30·1
30–34	282	338	30·0	323	471	36·5	518	750	36·2	589	779	33·1	827	1029	31·1	2539	3367	33·2

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 20–24 years (continued).															Total, 20–24 years.		
	20–21.			21–22.			22–23.			23–24.			24–25.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
35–36	21	21	*	33	38	(28·8)	46	66	(35·9)	57	76	(33·3)	82	98	(29·9)	239	299	31·3
36–37	16	30	*	20	36	*	35	56	(40·0)	52	56	(26·9)	77	83	(26·9)	200	261	32·6
37–38	10	18	*	25	27	(27·0)	35	44	(31·4)	50	40	(20·0)	44	69	(39·2)	164	198	30·2
38–39	13	17	*	17	23	*	26	25	(24·0)	37	41	(27·7)	54	53	(24·5)	147	159	27·0
39–40	15	12	*	16	18	*	13	27	*	18	32	*	28	40	(35·7)	90	129	(35·8)
35–39	75	98	(32·7)	111	142	32·0	155	218	35·2	214	245	28·6	285	343	30·1	840	1046	31·1
40–41	6	10	*	4	7	*	15	23	*	27	25	(23·1)	34	32	(23·5)	86	97	(28·2)
41–42	2	0	*	5	6	*	10	9	*	15	16	*	10	12	*	42	43	(25·6)
42–43	3	4	*	5	8	*	8	9	*	14	9	*	20	26	*	50	56	(28·0)
43–44	4	1	*	1	0	*	3	6	*	9	7	*	16	9	*	33	23	(17·4)
44–45	1	1	*	4	1	*	4	4	*	11	5	*	9	10	*	29	21	(18·1)
40–44	16	16	*	19	22	*	40	51	(21·9)	76	62	(20·4)	89	89	(25·0)	240	240	25·0
45–46	2	1	*	2	4	*	2	2	*	9	2	*	10	7	*	25	16	(16·0)
46–47	2	2	*	2	2	*	4	5	*	3	3	*	4	4	*	15	16	*
47–48	..	3	..	2	0	*	3	2	*	5	1	*	4	7	*	14	13	*
48–49	2	0	*	..	2	..	1	3	*	2	4	*	6	2	*	11	11	*
49–50	..	1	..	2	0	*	4	0	*	2	2	*	3	1	*	11	4	*
45–49	6	7	*	8	8	*	14	12	*	21	12	*	27	21	(19·4)	76	60	(19·7)
50–51	2	1	*	2	1	*	1	2	*	2	0	*	2	2	*	9	6	*
51–52	1	1	*	..	2	..	2	1	*	..	1	..	3	0	*	6	5	*
52–53	..	1	..	..	..	..	2	0	*	..	2	..	1	2	*	3	5	*
53–54	..	2	..	..	..	..	..	2	..	1	0	*	2	0	*	3	4	*
54–55	3	0	*	..	..	..	2	1	*	1	1	*	..	2	..	6	4	*
50–54	6	5	*	2	3	*	7	6	*	4	4	*	8	6	*	27	24	(22·2)

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 20–24 years (continued).															Total, 20–24 years.		
	20–21.			21–22.			22–23.			23–24.			24–25.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
55–56	1	0	*	..	1	..	1	1	*	..	..	..	..	1	..	2	3	*
56–57	..	..	..	..	..	..	1	0	*	..	..	..	..	..	..	1	0	*
57–58	..	..	..	..	2	..	..	..	..	1	0	*	2	1	*	3	3	*
58–59	..	..	..	..	1	..	2	1	*	1	1	*	1	2	*	4	5	*
59–60	..	..	..	..	..	..	..	..	..	1	1	*	2	2	*	3	3	*
55–59	1	0	*	..	4	..	4	2	*	3	2	*	5	6	*	13	14	*
60–61	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..
61–62	..	..	..	..	..	..	..	..	..	..	..	..	1	1	*	1	1	*
62–63	..	..	..	..	..	..	..	..	..	..	..	..	2	0	*	2	0	*
63–64	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
64–65	..	..	..		..	..	..	..	..	..	..	..	..	..	..	..	..	..
60–64	..	..	..	..	1	..	..	..	..	..	..	..	3	1	*	3	2	*
65–66	..	..	..	..	..	..	..	..	..	..	..	..	1	0	*	1	0	*
66–67	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
67–68	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..
68–69	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
69–70	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
65–69	..	..	..	..	..	..	..	..	..	..	..	..	1	1	*	1	1	*
Above 70 years	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Total general.	951	1329	34·9	1029	1694	41·2	1551	2336	37·7	1655	2336	35·3	2153	2827	32·8	7339	10522	35·8

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 25–29 years.															Total 25–29 years.		
	25–26.			26–27.			27–28.			28–29.			29–30.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
Under 20 years .	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..
20–21	1	1	*	1	2	*	..	..	..	..	1	..	..	..	..	2	4	*
21–22	..	1	..	..	..	..	1	2	*	1	1	*	..	2	..	2	6	*
22–23	5	5	*	4	2	*	..	..	..	3	0	*	..	1	..	12	8	*
23–24	8	8	*	15	13	*	4	7	*	6	5	*	1	5	*	34	38	(27·9)
24–25	36	40	(27·8)	25	34	(34·0)	20	22	*	23	21	*	9	5	*	113	122	27·0
20–24	50	55	(27·4)	45	51	(28·3)	25	31	(31·0)	33	28	(21·2)	10	13	*	163	178	27·3
25–26	99	127	(32·0)	58	73	(31·5)	33	34	(25·8)	38	45	(29·6)	17	23	*	245	302	30·8
26–27	111	154	34·7	155	195	31·5	71	93	(32·7)	65	81	(31·2)	33	40	(30·3)	435	563	32·4
27–28	178	250	35·1	170	196	28·8	154	195	31·7	83	88	(26·5)	42	79	(47·0)	627	808	32·2
28–29	184	267	36·3	187	287	38·4	160	218	34·0	188	216	28·7	66	115	(43·6)	785	1103	35·1
29–30	192	291	37·9	202	296	36·6	181	256	35·4	166	238	35·8	155	198	31·9	896	1279	35·7
25–29	764	1089	35·6	772	1047	33·9	599	796	33·2	540	668	30·9	313	455	36·3	2988	4055	33·9
30–31	244	318	32·6	271	338	31·2	222	303	34·1	253	302	29·8	158	236	37·3	1148	1497	32·6
31–32	218	257	29·5	216	280	32·4	203	274	33·7	213	244	28·6	193	217	28·1	1043	1272	30·5
32–33	168	252	37·5	219	319	36·4	225	266	29·6	262	331	31·6	191	209	27·4	1065	1377	32·3
33–34	162	175	27·0	203	233	28·7	180	208	28·9	192	235	30·6	166	253	38·1	903	1104	30·6
34–35	115	129	28·0	161	163	25·3	164	173	26·4	206	248	30·1	169	162	24·0	815	875	26·8
30–34	907	1131	31·2	1070	1333	31·1	994	1224	30·8	1126	1360	30·2	877	1077	30·7	4974	6125	30·8

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 25–29 years (continued).															Total 25–29 years.		
	25–26.			26–27.			27–28.			28–29.			29–30.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births. 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
35–36	121	164	33·9	132	149	28·2	149	140	23·5	178	184	25·8	166	179	27·0	746	816	27·3
36–37	77	72	(23·4)	140	160	28·6	116	110	23·7	141	157	27·8	130	141	27·1	604	640	26·5
37–38	80	76	(23·8)	84	93	(27·7)	132	137	25·9	110	119	27·0	118	121	25·6	524	546	26·0
38–39	59	61	(25·8)	90	82	(22·8)	86	104	(30·2)	185	153	20·7	116	96	20·7	536	496	23·1
39–40	50	53	(26·5)	62	72	(29·0)	71	52	(18·3)	80	72	(22·5)	109	142	32·6	372	391	26·3
35–39	387	426	27·5	508	556	27·4	554	543	24·5	694	685	24·7	639	679	26·6	2782	2889	26·0
40–41	40	43	(26·9)	76	46	(15·1)	65	44	(16·9)	105	76	18·1	87	76	(21·8)	373	285	19·1
41–42	15	18	*	43	31	(18·0)	38	35	(23·0)	54	47	(21·8)	42	34	(20·2)	192	165	21·5
42–43	18	23	*	31	33	(26·6)	37	28	(18·9)	53	42	(19·8)	50	52	(26·0)	189	178	23·5
43–44	18	20	*	19	26	*	26	19	(18·3)	30	28	(23·3)	30	30	(25·0)	123	123	25·0
44–45	8	6	*	22	25	*	24	10	*	24	25	*	29	24	(20·7)	107	90	21·0
40–44	99	110	(27·8)	191	161	21·1	190	136	17·9	266	218	20·5	238	216	22·7	984	841	21·4
45–46	13	15	*	17	18	*	21	13	*	34	20	(14·7)	26	16	(15·4)	111	82	18·5
46–47	15	5	*	32	19	(14·8)	13	12	*	19	14	*	25	21	(21·0)	104	71	17·1
47–48	3	6	*	7	4	*	8	5	*	16	16	*	12	14	*	46	45	(24·5)
48–49	9	4	*	9	5	*	9	6	*	12	14	*	14	10	*	53	39	(18·4)
49–50	3	2	*	4	5	*	10	5	*	11	7	*	9	9	*	37	28	(18·9)
45–49	43	32	(18·6)	69	51	(18·5)	61	41	(16·8)	92	71	(19·3)	86	70	(20·3)	351	265	18·9

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 25–29 years (continued).															Total, 25–29 years.		
	25–26.			26–27.			27–28.			28–29.			29–30.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
50–51	2	3	*	5	5	*	4	6	*	9	7	*	2	5	*	22	26	*
51–52	4	2	*	4	0	*	6	3	*	6	5	*	12	7	*	32	17	(13·3)
52–53	5	2	*	3	1	*	2	0	*	3	2	*	7	5	*	20	10	*
53–54	1	2	*	2	3	*	3	3	*	2	4	*	5	4	*	13	16	*
54–55	2	2	*	2	2	*	..	3	..	3	0	*	5	4	*	12	11	*
50–54	14	11	*	16	11	*	15	15	*	23	18	*	31	25	(20·2)	99	80	(20·2)
55–56	..	1	..	1	0	*	..	..	..	4	7	*	2	1	*	7	9	*
56–57	3	1	*	..	2	..	..	..	..	4	3	*	2	1	*	9	7	*
57–58	2	0	*	1	0	*	..	..	..	3	1	*	3	1	*	9	2	*
58–59	1	0	*	..	1	..	..	1	..	4	1	*	1	1	*	6	4	*
59–60	..	..	..	..	..	..	..	1	..	3	0	*	2	0	*	5	1	*
55–59	6	2	*	2	3	*	..	2	..	18	12	*	10	4	*	36	23	(15·8)
60–61	1	0	*	2	2	*	..	1	..	..	1	..	..	1	..	3	5	*
61–62	..	..	..	2	1	*	..	..	..	1	1	*	..	..	..	3	2	*
62–63	..	..	..	1	0	*	1	0	*	..	..	..	..	1	..	2	1	*
63–64	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	2	..
64–65	..	1	..	1	0	*	..	..	..	2	1	*	1	0	*	4	2	*
60–64	1	1	*	6	3	*	1	2	*	3	3	*	1	3	*	12	12	*

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 25–29 years (continued).															Total, 25–29 years.		
	25–26.			26–27.			27–28.			28–29.			29–30.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
65–66	..	..	..	..	..	..	..	..	..	1	0	*	2	0	*	3	0	*
66–67	1	0	*	..	..	..	..	1	..	1	2	*	..	..	..	2	3	*
67–68	..	..	..	..	..	..	..	..	..	..	..	..	2	0	*	2	0	*
68–69	..	1	..	1	0	*	..	..	..	1	0	*	..	..	..	2	1	*
69–70	1	0	*	..	..	..	..	..	..	1	0	*	..	..	..	2	0	*
65–69	2	1	*	1	0	*	..	1	..	4	2	*	4	0	*	11	4	*
70–71	1	0	*	..	..	..	..	..	..	..	..	..	1	0	*	2	0	*
71–72	..	..	..	..	..	..	..	..	..	..	..	..	1	0	*	1	0	*
72–73	..	..	..	1	0	*	..	..	..	..	..	..	..	..	..	1	0	*
73–74	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
74–75	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
70–74	1	0	*	1	0	*	..	..	..	..	..	..	2	0	*	4	0	*
Above 75 years .	1	0	*	..	..	..	..	..	..	..	..	..	1	0	*	2	0	*
Total, general	2275	2858	31·4	2681	3216	30·0	2439	2791	28·6	2799	3065	27·4	2212	2543	28·7	12406	14473	29·2

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 30–34 years.															Total 30–34 years.		
	30–31.			31–32.			32–33.			33–34.			34–35.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
Under 20 years .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20–21	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
21–22	..	..	..	..	..	..	1	0	*	..	2	..	..	..	..	1	2	*
22–23	1	0	*	..	..	..	..	1	..	..	..	..	..	1	..	1	2	*
23–24	2	2	*	3	5	*	1	0	*	2	2	*	1	1	*	9	10	*
24–25	15	9	*	9	7	*	4	2	*	4	3	*	3	6	*	35	27	(19·1)
20–24	18	12	*	12	12	*	6	3	*	6	7	*	4	8	*	46	42	(22·8)
25–26	20	21	*	10	12	*	6	10	*	4	9	*	7	11	*	47	63	(33·5)
26–27	49	48	(24·5)	27	15	(13·9)	21	21	*	13	13	*	12	7	*	122	104	21·3
27–28	64	56	(21·9)	36	49	(33·3)	40	40	(25·0)	24	16	*	14	12	*	178	173	24·3
28–29	107	108	25·2	62	45	(18·1)	59	52	(22·0)	43	43	(25·0)	25	27	(27·0)	296	275	23·2
29–30	108	115	26·6	65	83	(31·9)	52	70	(33·7)	36	48	(33·3)	27	31	(28·7)	288	347	30·1
25–29	348	348	25·0	200	204	25·5	178	193	27·1	120	129	26·8	85	88	(25·9)	931	962	25·8
30–31	296	235	19·8	111	104	23·4	96	119	(31·0)	75	58	(19·3)	51	39	(19·1)	629	555	22·1
31–32	216	211	24·4	218	175	20·1	109	106	24·3	89	88	(24·7)	54	45	(20·8)	686	625	22·8
32–33	265	319	30·1	157	166	26·4	245	226	23·1	104	82	19·7	93	68	(18·3)	864	861	24·9
33–34	290	255	22·0	200	154	19·3	207	203	24·5	206	162	19·7	103	85	20·6	1006	859	21·3
34–35	248	219	22·1	156	177	28·4	210	199	23·7	152	144	23·7	192	125	16·3	958	864	22·5
30–34	1315	1239	23·6	842	776	23·0	867	853	24·6	626	534	21·3	493	362	18·4	4143	3764	22·7

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 30–34 years (continued). 30–31. Number of families.	30–31. Births, 1889–92.	30–31. Per cent. per annum.	31–32. Number of families.	31–32. Births, 1889–92.	31–32. Per cent. per annum.	32–33. Number of families.	32–33. Births, 1889–92.	32–33. Per cent. per annum.	33–34. Number of families.	33–34. Births, 1889–92.	33–34. Per cent. per annum.	34–35. Number of families.	34–35. Births, 1889–92.	34–35. Per cent. per annum.	Total 30–34 years. Number of families.	Total 30–34 years. Births, 1889–92.	Total 30–34 years. Per cent. per annum.
35–36	224	230	25·7	152	173	28·5	201	180	22·4	178	146	20·5	148	128	21·6	903	857	23·7
36–37	254	214	21·1	154	167	27·1	215	186	21·6	160	163	25·5	184	166	22·6	967	896	23·2
37–38	221	191	21·6	134	138	25·7	184	171	23·2	177	169	23·9	158	140	22·2	874	809	23·1
38–39	192	139	18·1	167	129	19·3	216	162	18·8	181	153	21·1	216	135	15·6	972	718	18·5
39–40	153	135	22·1	112	115	25·7	133	149	28·0	152	119	19·6	148	148	25·0	698	666	23·9
35–39	1044	909	21·8	719	722	25·1	949	848	22·3	848	750	22·1	854	717	21·0	4414	3946	22·3
40–41	212	139	16·4	91	78	(21·4)	181	104	14·4	181	115	15·9	147	108	18·4	812	544	16·7
41–42	96	68	(17·7)	98	92	(23·4)	89	80	(22·5)	90	70	(19·4)	122	80	16·4	495	390	19·7
42–43	91	77	(21·1)	87	60	(17·2)	163	120	18·4	102	78	19·1	107	77	18·0	550	412	18·7
43–44	80	32	(10·0)	40	34	(21·3)	97	51	(13·1)	112	72	16·1	99	54	(13·6)	428	243	14·2
44–45	49	36	(18·4)	64	35	(13·7)	67	38	(14·2)	68	49	(18·0)	104	75	18·0	352	233	16·5
40–44	528	352	16·7	380	299	19·7	597	393	16·5	553	384	17·4	579	394	17·0	2637	1822	17·3
45–46	71	34	(12·0)	36	32	(22·2)	73	47	(16·1)	66	37	(14·0)	81	39	(12·0)	327	189	14·4
46–47	47	34	(18·1)	46	24	(13·0)	58	39	(16·8)	49	25	(12·8)	75	22	(7·3)	275	144	13·1
47–48	31	21	(16·9)	35	20	(14·3)	42	28	(16·7)	49	28	(14·3)	58	34	(14·7)	215	131	15·2
48–49	36	16	(11·1)	23	13	*	37	19	(12·8)	24	15	*	43	27	(15·7)	163	90	15·8
49–50	17	11	*	23	10	*	26	11	(10·6)	13	13	*	33	16	(12·1)	112	61	13·6
45–49	202	116	14·4	163	99	15·2	236	144	15·3	201	118	14·7	290	138	11·9	1092	615	14·1

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 30–34 years (continued). 30–31.			31–32.			32–33.			33–34.			34–35.			Total 30–34 years.		
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
50–51	16	12	*	11	5	*	16	14	*	19	16	*	38	13	(8·6)	100	60	15·0
51–52	12	6	*	12	3	*	11	9	*	17	4	*	17	8	*	69	30	(10·9)
52–53	10	9	*	6	5	*	20	16	*	17	4	*	23	7	*	76	41	(13·5)
53–54	10	3	*	5	4	*	4	6	*	18	11	*	16	6	*	53	30	(14·2)
54–55	13	6	*	10	2	*	14	3	*	16	2	*	18	10	*	71	23	(8·1)
50–54	61	36	(14·8)	44	19	(10·8)	65	48	(18·5)	87	37	(10·6)	112	44	9·8	369	184	12·5
55–56	10	2	*	6	5	*	6	3	*	5	4	*	10	6	*	37	20	(13·5)
56–57	11	1	*	6	1	*	3	6	*	8	5	*	11	4	*	39	17	(10·9)
57–58	5	2	*	3	3	*	4	2	*	4	1	*	9	3	*	25	11	(11·0)
58–59	3	2	*	4	0	*	5	2	*	5	0	*	7	2	*	24	6	*
59–60	..	..	*	..	..	..	4	1	*	4	2	*	3	4	*	11	7	*
55–59	29	7	(6·0)	19	9	*	22	14	*	26	12	(11·5)	40	19	(11·9)	136	61	11·2
60–61	9	0	*	2	0	*	6	0	*	3	0	*	9	3	*	29	3	(2·4)
61–62	..	1	..	1	0	*	..	1	..	3	0	*	1	0	*	5	2	*
62–63	4	1	*	2	0	*	2	1	*	..	..	..	1	0	*	9	2	*
63–64	..	..	..	1	0	*	2	1	*	2	0	*	2	0	*	7	1	*
64–65	2	0	*	1	0	*	1	0	*	3	1	*	1	0	*	8	1	*
60–64	15	2	*	7	0	*	11	3	*	11	1	*	14	3	*	58	9	(3·8)

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers, 30–34 years (continued).															Total 30–34 years.		
	30–31.			31–32.			32–33.			33–34.			34–35.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
65–66	2	0	*	..	..	..	3	0	*	1	0	*	..	..	..	6	0	*
66–67	1	0	*	..	1	..	..	..	..	1	0	*	..	..	..	2	1	*
67–68	1	0	*	..	..	..	1	0	*	..	1	..	1	0	*	3	1	*
68–69	..	..	..	..	..	..	1	1	*	..	..	..	1	0	*	2	1	*
69–70	1	0	*	..	..	..	1	0	*	1	0	*	2	1	*	5	1	*
65–69	5	0	*	..	1	..	6	1	*	3	1	*	4	1	*	18	4	*
70–71	..	1	..	1	0	*	..	1	..	1	0	*	..	..	..	2	2	*
71–72	1	0	*	..	1	..	2	0	*	1	0	*	1	0	*	5	1	*
72–73	..	..	..	..	..	..	2	0	*	1	0	*	..	..	..	3	0	*
73–74	1	0	*	..	..	..	..	..	..	..	..	..	..	..	..	1	0	*
74–75	..	..	..	1	0	*	..	..	..	..	..	..	..	..	..	1	0	*
70–74	2	1	*	2	1	*	4	1	*	3	0	*	1	0	*	12	3	*
Above 75 years .	..	..	..	..	..	..	..	..	..	1	0	*	1	0	*	2	0	*
Total, general	3567	3022	21·2	2388	2142	22·4	2941	2501	21·3	2485	1973	19·8	2477	1774	17·9	13858	11412	20·6

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 35–39 years.															Total 35–39 years.		
	35–36.			36–37.			37–38.			38–39.			39–40.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
Under 20 years.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20–21	..	..	..	..	..	..	..	..	..	1	0	*	..	..	..	1	0	*
21–22	1	1	*	..	..	..	..	..	..	..	..	..	..	..	..	1	1	*
22–23	..	..	..	1	0	*	..	..	..	..	..	..	..	..	..	1	0	*
23–24	2	0	..	..	1	..	1	1	*	2	0	*	..	..	..	5	2	*
24–25	3	1	*	2	0	*	..	..	..	1	2	*	..	3	..	6	6	*
20–24	6	2	*	3	1	*	1	1	*	4	2	*	..	3	..	14	9	*
25–26	3	3	*	3	4	*	2	0	*	3	3	*	2	3	*	13	13	*
26–27	8	6	*	3	5	*	3	3	*	5	2	*	5	3	*	24	19	*
27–28	15	12	*	6	10	*	9	5	*	7	5	*	2	5	*	39	37	(23·7)
28–29	27	17	(15·8)	16	11	*	6	5	*	12	10	*	5	7	*	66	50	(18·9)
29–30	20	24	*	17	13	*	4	15	*	11	6	*	11	4	*	63	62	(24·6)
25–29	73	63	(21·2)	45	43	(23·9)	24	28	*	38	26	(17·1)	25	22	(22·0)	205	181	22·1
30–31	46	36	(19·6)	26	20	(19·2)	22	20	*	19	15	*	10	6	*	123	97	19·7
31–32	54	35	(16·2)	46	37	(20·1)	22	13	*	29	16	(13·8)	16	12	*	167	113	16·9
32–33	49	41	(20·9)	65	34	(13·1)	28	21	(18·8)	30	23	(19·2)	16	13	*	188	132	17·6
33–34	56	57	(25·4)	73	56	(19·2)	39	32	(20·5)	45	27	(15·0)	26	18	(17·3)	239	190	19·9
34–35	87	63	(18·1)	72	54	(18·8)	43	32	(18·6)	34	27	(19·9)	29	16	(13·8)	265	192	18·1
30–34	292	232	19·9	282	201	17·8	154	118	19·2	157	108	17·2	97	65	(16·8)	982	724	18·4

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 35–39 years (continued).															Total 35–39 years.		
	35–36.			36–37.			37–38.			38–39.			39–40.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
35–36	193	141	18·3	71	66	(23·2)	53	50	(23·6)	62	30	(12·1)	18	13	*	397	300	18·9
36–37	149	125	21·0	218	135	15·5	88	55	(15·6)	97	50	(12·9)	53	32	(15·1)	605	397	16·4
37–38	184	145	19·7	150	122	20·3	170	103	15·1	73	51	(17·5)	51	41	(20·1)	628	462	18·4
38–39	179	139	19·4	196	155	19·8	171	100	14·6	228	113	12·4	69	45	(16·3)	843	552	16·4
39–40	175	133	19·0	171	132	19·3	149	125	21·0	159	91	14·3	140	101	(18·0)	794	582	18·3
35–39	880	683	19·4	806	610	18·9	631	433	17·2	619	335	13·5	331	232	17·5	3267	2293	17·5
40–41	188	128	17·0	218	183	21·0	171	103	15·1	215	148	17·2	148	83	14·0	940	645	17·2
41–42	142	71	12·5	143	98	17·1	131	114	21·8	165	87	13·2	112	73	16·3	693	443	16·0
42–43	118	80	17·0	183	110	15·0	130	93	17·9	183	101	13·8	122	88	18·0	736	472	16·0
43–44	95	43	(11·3)	112	75	16·7	120	73	15·2	133	76	14·3	110	58	13·2	570	325	14·3
44–45	97	36	(9·3)	92	55	(14·9)	109	56	12·9	135	65	12·0	74	62	(20·9)	507	274	13·5
40–44	640	358	14·0	748	521	17·4	661	439	16·6	831	477	14·4	566	364	16·1	3446	2159	15·7
45–46	119	58	12·2	119	45	9·5	93	59	(15·9)	178	64	9·0	111	66	14·9	620	292	11·8
46–47	80	29	(9·1)	147	76	12·9	104	36	8·7	132	48	9·1	128	44	8·6	591	233	9·9
47–48	64	24	(9·4)	61	38	(15·6)	99	52	(13·1)	106	42	9·9	85	39	(11·5)	415	195	11·7
48–49	39	24	(15·4)	64	34	(13·3)	60	29	(12·1)	136	43	7·9	66	30	(11·4)	365	160	11·0
49–50	41	14	(8·5)	46	25	(13·6)	43	20	(11·6)	79	21	(6·6)	86	26	(7·6)	295	106	9·0
45–49	343	149	10·9	437	218	12·5	399	196	12·3	631	218	8·6	476	205	10·8	2286	986	10·8

TABLE I.—The Table of Natality (continued.)

Age of the fathers.	Age of the mothers, 35–39 years (continued).															Total 35–39 years.		
	35–36.			36–37.			37–38.			38–39.			39–40.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
50–51	47	15	(8·0)	50	17	(8·4)	55	31	(14·1)	88	21	(6·0)	45	26	(14·4)	285	110	9·6
51–52	17	18	*	43	26	(15·1)	35	17	(12·1)	38	13	(8·6)	36	13	(9·0)	169	87	12·9
52–53	28	12	(10·7)	41	21	(12·8)	35	18	(12·9)	44	14	(8·0)	32	15	(11·7)	180	80	11·1
53–54	16	4	*	21	13	*	24	11	*	30	12	(10·0)	36	11	(7·6)	127	51	10·0
54–55	14	4	*	28	7	(6·3)	16	6	*	29	7	(6·0)	37	9	(6·1)	124	33	6·7
50–54	122	53	10·9	183	84	11·5	165	83	12·6	229	67	7·3	186	74	9·9	885	361	10·2
55–56	13	7	*	10	3	*	20	7	*	26	4	(3·8)	18	4	*	87	25	(7·2)
56–57	10	5	*	18	6	*	7	2	*	20	6	*	19	6	*	74	25	(8·4)
57–58	8	2	*	10	3	*	11	5	*	25	4	(4·0)	14	2	*	68	16	(5·9)
58–59	7	1	*	10	3	*	9	5	*	20	7	*	13	5	*	59	21	(8·9)
59–60	3	2	*	7	0	*	7	2	*	11	2	*	5	4	*	33	10	(7·6)
55–59	41	17	(10·4)	55	15	(6·8)	54	21	(9·7)	102	23	5·6	69	21	(7·6)	321	97	7·6
60–61	4	1	*	6	1	*	6	0	*	10	0	*	5	4	*	31	6	(4·8)
61–62	4	0	*	3	3	*	5	3	*	8	2	*	7	1	*	27	9	(7·8)
62–63	1	1	*	1	0	*	7	0	*	4	0	*	6	3	*	19	4	*
63–64	2	0	*	5	1	*	4	1	*	11	2	*	2	3	*	24	7	*
64–65	2	0	*	3	0	*	4	1	*	7	1	*	7	0	*	23	2	*
60–64	13	2	*	18	5	*	26	5	(4·8)	40	5	(3·1)	27	11	(10·2)	124	28	5·6

Table I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 35–39 years (continued).															Total 35–39 years.		
	35–36.			36–37.			37–38.			38–39.			39–40.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
65–66	2	1	*	..	1	..	4	0	*	4	0	*	2	1	*	12	3	*
66–67	4	0	*	3	0	*	4	0	*	4	2	*	2	0	*	17	2	*
67–68	1	0	*	2	2	*	3	0	*	4	0	*	1	0	*	11	2	*
68–69	..	..	..	1	0	*	2	0	*	2	2	*	5	1	*	10	3	*
69–70	..	..	..	..	..	..	..	..	..	1	0	*	..	..	..	1	0	*
65–69	7	1	*	6	3	*	13	0	*	15	4	*	10	2	*	51	10	(4·9)
70–71	3	0	*	1	1	*	1	1	*	2	1	*	1	0	*	8	3	*
71–72	..	..	..	..	..	..	1	0	*	..	..	..	1	0	*	2	0	*
72–73	..	..	..	..	..	..	2	0	*	2	0	*	..	..	..	4	0	*
73–74	..	..	..	1	0	*	..	..	..	..	..	..	..	..	..	1	0	*
74–75	1	0	*	1	0	*	..	..	..	..	..	..	..	..	..	2	0	*
70–74	4	0	*	3	1	*	4	1	*	4	1	*	2	0	*	17	3	*
Above 75 years .	2	0	*	3	0	*	1	0	*	5	1	*	1	0	*	12	1	*
Total, general	2423	1559	16·1	2589	1702	16·4	2133	1325	15·5	2675	1267	11·8	1790	999	14·0	11610	6852	147

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 40–44 years.															Total 40–44 years.		
	40–41.			41–42.			42–43.			43–44.			44–45.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–1892.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
Under 20 years .	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
20–21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
21–22	1	0	*	..	..	..	..	..	..	..	..	..	..	..	..	1	0	*
22–23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
23–24	1	0	*	..	..	..	..	..	..	..	..	..	..	..	..	1	0	*
24–25	1	0	*	..	1	..	..	..	..	1	0	*	..	..	..	2	1	*
20–24	3	0	*	..	1	..	..	..	..	1	0	*	..	..	..	4	1	*
25–26	1	1	*	1	0	*	2	0	*	1	0	*	1	0	*	6	1	*
26–27	2	2	*	2	1	*	1	1	*	..	..	..	4	0	*	9	4	*
27–28	2	1	*	2	5	*	..	2	..	..	..	..	1	0	*	5	8	*
28–29	7	9	*	3	2	*	4	1	*	2	0	*	1	0	*	17	12	*
29–30	6	2	*	3	0	*	1	5	*	3	0	*	..	..	..	13	7	*
25–29	18	15	*	11	8	*	8	9	*	6	0	*	7	0	*	50	32	(16·0)
30–31	17	8	*	6	4	*	7	0	*	3	0	*	6	1	*	39	13	(8·3)
31–32	14	8	*	5	2	*	7	3	*	6	0	*	3	1	*	35	14	(10·0)
32–33	17	3	*	17	6	*	13	3	*	5	1	*	7	2	*	59	15	(6·4)
33–34	31	11	(8·9)	15	4	*	12	2	*	10	0	*	8	0	*	76	17	(5·6)
34–35	31	16	(12·9)	16	8	*	18	1	*	4	0	*	8	1	*	77	26	(8·4)
30–34	110	46	10·5	59	24	(10·2)	57	9	(3·9)	28	1	(0·7)	32	5	(3·9)	286	85	7·4

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mother 40–44 years (continued).															Total 40–44 years.		
	40–41.			41–42.			42–43.			43–44.			44–45.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
35–36	32	11	(8·6)	15	6	*	20	2	*	6	2	*	6	0	*	79	21	(6·4)
36–37	42	18	(10·7)	25	14	(14·0)	26	7	(6·7)	13	3	*	13	1	*	119	43	9·0
37–38	53	18	(8·5)	20	13	*	41	7	(4·3)	16	1	*	11	2	*	141	41	7·3
38–39	102	39	9·6	37	17	(11·5)	46	10	(5·4)	22	2	*	19	1	*	226	69	7·6
39–40	63	47	(18·7)	44	18	(10·2)	47	14	(7·4)	30	11	(9·2)	21	3	*	205	93	11·3
35–39	292	133	11·4	141	68	(12·0)	180	40	5·6	87	19	(5·5)	70	7	2·5	770	267	8·7
40–41	231	88	9·5	76	21	(6·9)	79	18	(5·7)	46	8	(4·3)	30	4	(3·3)	462	139	7·5
41–42	118	52	11·0	95	34	(8·9)	62	18	(7·3)	45	11	(6·1)	31	4	(3·2)	351	119	8·5
42–23	199	105	13·2	90	37	(10·3)	148	40	6·8	63	10	(4·0)	49	7	(3·6)	549	199	9·1
43–44	152	65	10·7	90	42	(11·7)	107	24	5·6	87	16	(4·6)	59	12	(5·1)	495	159	8·0
44–45	164	58	8·8	82	34	(10·4)	122	32	6·6	75	13	(4·3)	103	14	3·4	546	151	6·9
40–44	864	368	10·6	433	168	(9·7)	518	132	6·4	316	58	4·6	272	41	3·8	2403	767	8·0
45–46	176	64	9·1	101	39	(9·7)	145	29	5·0	106	13	3·1	103	9	2·2	631	154	6·1
46–47	161	59	9·2	110	30	(6·8)	147	36	6·1	92	22	(6·0)	136	12	2·2	646	159	6·1
47–48	113	43	9·5	70	35	(12·5)	129	23	4·5	96	18	(4·7)	109	11	2·5	517	130	6·3
48–49	114	33	7·2	77	13	(4·2)	151	18	3·0	86	12	(3·5)	103	12	2·9	531	88	4·1
49–50	80	20	(6·3)	64	14	(5·5)	90	15	(4·2)	71	11	(3·9)	75	15	(5·0)	380	75	4·9
45–49	644	219	8·5	422	131	7·8	662	121	4·6	451	76	4·2	526	59	2·8	2705	606	5·6

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 40–44 years (continued).															Total 40–44 years.		
	40–41.			41–42.			42–43.			43–44.			44–45.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
50–51	151	30	5·0	63	17	(6·7)	126	17	3·4	78	9	(2·9)	113	9	2·0	531	82	3·9
51–52	60	14	(5·8)	66	12	(4·5)	67	9	(3·4)	41	9	(5·5)	76	3	(0·9)	310	47	3·8
52–53	57	11	(4·8)	37	9	(6·1)	109	20	4·6	60	8	(3·3)	73	4	(1·4)	336	52	3·9
53–54	61	13	(5·3)	34	10	(7·4)	77	6	(1·9)	83	12	(3·6)	60	7	(2·9)	315	48	3·8
54–55	42	5	(3·0)	30	6	(5·0)	58	6	(2·6)	43	4	(2·3)	72	8	(2·8)	245	29	3·0
50–54	371	73	4·9	230	54	(5·9)	437	58	3·3	305	42	3·4	394	31	2·0	1737	258	3·7
55–56	41	4	(2·4)	17	3	*	42	6	(3·6)	40	6	(3·8)	40	0	(0·0)	180	19	2·6
56–57	26	6	(5·8)	36	10	(6·9)	34	7	(5·1)	29	6	(5·2)	31	3	(2·2)	156	32	5·1
57–58	30	2	(1·6)	13	2	*	41	4	(2·4)	29	2	(1·7)	31	1	(0·6)	144	11	1·9
58–59	24	4	*	18	3	*	19	1	*	19	3	*	18	0	*	98	11	(2·8)
59–60	6	0	*	4	0	*	20	2	*	11	0	*	14	0	*	55	2	(0·9)
55–59	127	16	3·1	88	18	(5·1)	156	20	3·2	128	17	3·3	134	4	0·7	633	75	3·0
60–61	26	4	(3·8)	7	2	*	21	3	*	18	2	*	28	2	(1·7)	100	13	3·3
61–62	10	1	*	8	0	*	11	0	*	8	1	*	8	0	*	45	2	(1·1)
62–63	8	1	*	6	1	*	10	2	*	7	1	*	13	0	*	44	5	(2·8)
63–64	7	3	*	9	0	*	9	0	*	11	1	*	8	0	*	44	4	(2·3)
64–65	9	0	*	10	1	*	13	0	*	3	0	*	8	0	*	43	1	(0·5)
60–64	60	9	(3·8)	40	4	(2·5)	64	5	2·0	47	5	2·7	65	2	(0·8)	276	25	2·3

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers 40–44 years (continued).															Total 40–44 years.		
	40–41.			41–42.			42–43.			43–44.			44–45.					
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
65–66	8	0	*	6	0	*	8	1	*	4	1	*	8	0	*	34	2	(1·5)
66–67	2	1	*	4	0	*	5	1	*	..	1	*	6	0	*	17	3	*
67–68	3	1	*	1	0	*	3	2	*	1	0	*	6	0	*	14	3	*
68–69	1	0	*	1	0	*	1	0	*	2	0	*	6	0	*	11	0	*
69–70	1	0	*	1	1	*	2	0	*	1	0	*	3	0		8	1	*
65–69	15	2	*	13	1	*	19	4	*	8	2	*	29	0	(0·0)	84	9	(2·6)
70–71	3	0	*	3	0	*	4	0	*	3	0	*	4	0	*	17	0	*
71–72	2	1	*	3	0	*	..	..	..	..	..	..	1	0	*	6	1	*
72–73	1	0	*	..	..	..	1	0	*	1	0	*	1	0	*	4	0	*
73–74	1	0	*	1	0	*	2	0	*	1	0	*	1	0	*	6	0	*
74–75	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
70–74	7	1	*	7	0	*	7	0	*	5	0	*	7	0	*	33	1	(0·6)
Above 75 years .	4	0	*	1	0	*	6	0	*	3	0	*	4	0	*	18	0	*
Total general	2515	882	8·8	1445	477	8·3	2114	398	4·7	1385	220	4·0	1540	149	2·4	8999	2126	5·9

TABLE I.—The Table of Natality (continued).

Age of the fathers.	Age of the mothers above 45 years.			Total general.		
	Number of families.	Births, 1889–92.	Per cent. per annum.	Number of families.	Births, 1889–92.	Per cent. per annum.
Under 20 years	1	0	*	3	2	*
20–21	..	..	..	7	15	*
21–22	..	..	..	20	24	*
22–23	1	0	*	53	57	(26·9)
23–24	..	..	..	154	205	33·3
24–25	..	..	..	492	667	33·9
20–24	1	0	*	726	968	33·3
25–26	..	..	..	834	1,299	38·9
26–27	2	0	*	1,312	1,913	36·5
27–28	6	0	*	1,664	2,314	34·8
28–29	12	1	*	2,045	2,789	34·1
29–30	6	0	*	1,980	2,901	36·6
25–29	26	1	(1·0)	7,835	11,216	35·8
30–31	18	0	*	2,759	3,254	29·5
31–32	27	1	(0·9)	2,554	2,824	27·6
32–33	28	4	(3·6)	2,719	3,173	29·2
33–34	36	1	(0·7)	2,737	2,747	25·1
34–35	31	3	(2·4)	2,482	2,378	24·0
30–34	140	9	1·6	13,251	14,376	27·1
35–36	46	3	(1·6)	2,422	2,316	23·9
36–37	59	1	(0·4)	2,565	2,258	22·0
37–38	59	1	(0·4)	2,402	2,066	21·5
38–39	86	3	(0·9)	2,817	2,006	17·8
39–40	99	3	(0·8)	2,261	1,870	20·7
35–39	349	11	0·8	12,467	10,516	21·1
40–41	134	6	1·1	2,810	1,719	15·3
41–42	142	7	1·2	1,915	1,169	15·3
42–43	198	5	0·6	2,274	1,326	14·6
43–44	215	8	0·9	1,866	883	11·8
44–45	245	11	1·1	1,787	781	10·9
40–44	934	37	1·0	10,652	5,878	13·8
45–46	372	19	1·3	2,088	755	9·0
46–47	502	17	0·8	2,135	640	7·5
47–48	450	12	0·7	1,657	526	7·9
48–49	642	16	0·6	1,765	404	5·7
49–50	563	17	0·8	1,398	291	5·2
45–49	2529	81	0·8	9,043	2,616	7·2
50–51	799	11	0·3	1,746	295	4·2
51–52	606	9	0·4	1,193	195	4·1
52–53	788	5	0·2	1,403	193	3·4
53–54	697	8	0·3	1,208	157	3·2
54–55	788	8	0·3	1,246	108	2·2
50–54	3,578	41	0·3	6,796	948	3·5
55–56	661	5	0·2	974	81	2·1
56–57	781	7	0·2	1,060	88	2·1
57–58	671	3	0·1	921	46	1·2
58–59	663	0	0·0	854	47	1·4
59–60	420	1	0·06	528	25	1·2
55–59	3,196	16	0·13	4,337	287	1·7
60–61	740	2	0·07	903	30	0·8
61–62	449	2	0·11	530	18	0·8
62–63	509	2	0·1	585	14	0·6
63–64	441	0	0·0	516	14	0·7
64–65	478	0	0·0	556	6	0·3
60–64	2,617	6	0·06	3,090	82	0·7
65–66	484	0	0·0	540	5	0·2
66–67	407	0	0·0	445	9	0·5
67–68	332	0	0·0	362	7	0·5
68–69	309	0	0·0	334	5	0·4
69–70	220	0	0·0	236	2	0·2
65–69	1,752	0	0·0	1,917	28	0·4
70–71	335	0	0·0	364	5	0·3
71–72	204	1	0·12	218	3	0·3
72–73	216	0	0·0	228	0	0·0
73–74	171	0	0·0	179	0	0·0
74–75	128	0	0·0	131	0	0·0
70–74	1,054	1	0·02	1,120	8	0·2
Above 75 years	529	0	0·0	563	1	0·04
Total general	16,806	203	0·30	71,800	46,926	16·3

Table II.—Bigenous Probability of Annual Births in 100 Families, ac

Age of the Father.	18–19	19–20	20–21	21–22	22–23	23–24	24–25	25–26	26–27	27–28	28–29	29–30	30–31	31–32
23–24	*	*	*	*	*	(22·0)	*	*	*	*	*	*	*	*
24–25	*	(42·0)	(40·2)	(48·9)	(34·0)	(46·1)	(24·1)	(27·8)	(34·0)	*	*	*	*	*
25–26	(43·5)	(62·8)	(34·3)	(49·7)	43·9	(47·5)	(40·9)	(32·0)	(31·5)	(25·8)	(29·6)	*	*	*
26–27	(53·0)	(47·4)	(49·7)	46·8	45·1	39·5	33·8	34·7	31·5	(32·7)	(31·2)	(30·3)	(24·5)	(13·9)
27–28	(31·3)	(53·4)	37·2	41·7	39·8	40·5	38·4	35·1	28·8	31·7	(26·5)	(47·0)	(21·9)	(33·3)
28–29	(35·5)	(54·0)	34·6	40·7	33·6	45·8	36·9	36·3	38·4	34·0	28·7	(43·6)	25·2	(18·1)
29–30	*	(35·3)	(35·7)	(53·5)	46·0	38·3	42·6	37·9	36·6	35·4	35·8	31·9	26·6	(31·9)
30–31	*	(33·9)	30·7	(38·4)	36·8	33·6	32·6	32·6	31·2	34·1	29·8	37·3	19·8	23·4
31–32	*	*	(24·6)	(38·0)	33·0	36·2	30·7	29·5	32·4	33·7	28·6	28·1	24·4	20·1
32–33	*	*	(37·5)	(34·3)	40·4	38·2	36·0	37·5	36·4	29·6	31·6	27·4	30·1	26·4
33–34	*	*	(28·4)	(35·9)	(37·0)	28·1	25·2	27·0	28·7	28·9	30·6	38·1	22·0	19·3
34–35	*	*	*	(33·5)	(32·3)	(27·4)	29·2	28·0	25·3	26·4	30·1	24·0	22·1	28·4
35–36	*	*	*	(28·8)	(35·9)	(33·3)	(29·9)	33·9	28·2	23·5	25·8	27·0	25·7	28·5
36–37	*	*	*	*	(40·0)	(26·9)	(26·9)	(23·4)	28·6	23·7	27·8	27·1	21·1	27·1
37–38	*	*	*	(27·0)	(31·4)	(20·0)	(39·2)	(23·8)	(27·7)	25·9	27·0	25·6	21·6	25·7
38–39	*	*	*	*	(24·0)	(27·7)	(24·5)	(25·8)	(22·8)	(30·2)	20·7	20·7	18·1	19·3
39–40	*	*	*	*	*	*	(35·7)	(26·5)	(29·0)	(18·3)	(22·5)	32·6	22·1	25·7
40–41	*	*	*	*	*	(23·1)	(23·5)	(26·9)	(15·1)	(16·9)	18·1	(21·8)	16·4	(21·4)
41–42	*	*	*	*	*	*	*	*	(18·0)	(23·0)	(21·8)	(20·2)	(17·7)	(23·4)
42–43	*	*	*	*	*	*	*	*	(26·6)	(18·9)	(19·8)	(20·0)	(21·1)	(17·2)
43–44	*	*	*	*	*	*	*	*	*	(18·3)	(23·3)	(25·0)	(10·0)	(21·3)
44–45	*	*	*	*	*	*	*	*	*	*	*	(20·7)	(18·4)	(13·7)
45–46	*	*	*	*	*	*	*	*	*	*	(14·7)	(15·4)	(12·0)	(22·2)
46–47	*	*	*	*	*	*	*	*	(14·8)	*	*	(21·0)	(18·1)	(13·0)
47–48	*	*	*	*	*	*	*	*	*	*	*	*	(16·9)	(14·3)
48–49	*	*	*	*	*	*	*	*	*	*	*	*	(11·1)	*
49–50	*	*	*	*	*	*	*	*	*	*	*	*	*	*
50–51	*	*	*	*	*	*	*	*	*	*	*	*	*	*
51–52	*	*	*	*	*	*	*	*	*	*	*	*	*	*
52–53	*	*	*	*	*	*	*	*	*	*	*	*	*	*
53–54	*	*	*	*	*	*	*	*	*	*	*	*	*	*
54–55	*	*	*	*	*	*	*	*	*	*	*	*	*	*
55–56	*	*	*	*	*	*	*	*	*	*	*	*	*	*
56–57	*	*	*	*	*	*	*	*	*	*	*	*	*	*
57–58	*	*	*	*	*	*	*	*	*	*	*	*	*	*
58–59	*	*	*	*	*	*	*	*	*	*	*	*	*	*
59–60	*	*	*	*	*	*	*	*	*	*	*	*	*	*

The figures in brackets are deduced from less than 100

Where the number of families was less than 25, no prob

The full line connects the maxima of each column, the d

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ilies, according to the Age of the Father and of the Mother respectively (rough figures).

Age of the MOTHER.

31–32	32–33	33–34	34–35	35–36	36–37	37–38	38–39	39–40	40–41	41–42	42–43	43–44	44–45	45–46	46–47	4
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
(13·9)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
(33·3)	(25·0)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
(18·1)	(22·0)	(25·0)	(27·0)	(15·8)	*	*	*	*	*	*	*	*	*	*	*	
(31·9)	(33·7)	(33·3)	(28·7)	*	*	*	*	*	*	*	*	*	*	*	*	
23·4	(31·0)	(19·3)	(19·1)	(19·6)	(19·2)	*	*	*	*	*	*	*	*	*	*	
20·1	24·3	(24·7)	(20·8)	(16·2)	(20·1)	*	(13·8)	*	*	*	*	*	*	*	*	
26·4	23·1	19·7	(18·3)	(20·9)	(13·1)	(18·8)	(19·2)	*	*	*	*	*	*	*	*	
19·3	24·5	19·7	20·6	(25·4)	(19·2)	(20·5)	(15·0)	(17·3)	(8·9)	*	*	*	*	*	*	
28·4	23·7	23·7	16·3	(18·1)	(18·8)	(18·6)	(19·9)	(13·8)	(12·9)	*	*	*	*	*	*	
28·5	22·4	20·5	21·6	18·3	(23·2)	(23·6)	(12·1)	*	(8·6)	*	*	*	*	*	*	
27·1	21·6	25·5	22·6	21·0	15·5	(15·6)	(12·9)	(15·1)	(10·7)	(14·0)	(6.7)	*	*	*	*	
25·7	23·2	23·9	22·2	19·7	20·3	15·1	(17·5)	(20·1)	(8·5)	*	(4·3)	*	*	*	*	
19·3	18·8	21·1	15·6	19·4	19·8	14·6	12·4	(16·3)	9·6	(11·5)	(5·4)	*	*	*	*	
25·7	28·0	19·6	25·0	19·0	19·3	21·0	14·3	18·0	(18·7)	(10·2)	(7·4)	(9·2)	*	(0·7)	*	
(21·4)	14·4	15·9	18·4	17·0	21·0	15·1	17·2	14·0	9·5	(6·9)	(5·7)	(4·3)	(3·3)	(2·3)	*	
(23·4)	(22·5)	(19·4)	16·4	12·5	17·1	21·8	13·2	16·3	11·0	(8·9)	(7·3)	(6·1)	(3·2)	(2·1)	*	
(17·2)	18·4	19·1	18·0	17·0	15·0	17·9	13·8	18·0	13·2	(10·3)	6·8	(4·0)	(3·6)	(0·4)	(1·9)	
(21·3)	(13·1)	16·1	(13·6)	(11·3)	16·7	15·2	14·3	13·2	10·7	(11·7)	5·6	(4·6)	(5·1)	(2·0)	(0·4)	
(13·7)	(14·2)	(18·0)	18·0	(9·3)	(14·9)	12·9	12·0	(20·9)	8·8	(10·4)	6·6	(4·3)	3·4	(3·5)	(0·4)	
(22·2)	(16·1)	(14·0)	(12·0)	12·2	9·5	(15·9)	9·0	14·9	9·1	9·7	5·0	3·1	2·2	2·7	(2·0)	
(13·0)	(16·8)	(12·8)	(7·3)	(9·1)	12·9	8·7	9·1	8·6	9·2	6·8	6·1	(6·0)	2·2	(2·0)	0·7	
(14·3)	(16·7)	(14·3)	(14·7)	(9·4)	(15·6)	(13·1)	9·9	(11·5)	9·5	(12·5)	4·5.	(4·7)	2·5	(1·3)	(0·3)	
*	(12·8)	(15·6)	(15·7)	(15·4)	(13·3)	(12·1)	7·9	(11·4)	7·2	(4·2)	3·0	(3·5)	2·9	2·0	(1·0)	
*	(10·6)	*	(12·1)	(8·5)	(13·6)	(11·6)	(6·6)	(7·6)	(6·3)	(5·5)	(4·2)	(3·9)	(5·0)	(2·5)	(0·6)	
*	*	*	(8·6)	(8·0)	(8·4)	(14·1)	(6·0)	(14·4)	5·0	(6·7)	3·4	(2·9)	2·0	1·1	0·4	
*	*	*	*	*	(15·1)	(12·1)	(8·6)	(9·0)	(5·8)	(4·5)	(3·4)	(5·5)	(0·9)	(0·9)	(0·3)	
*	*	*	*	(10·7)	(12·8)	(12·9)	(8·0)	(11·7)	(4·8)	(6·1)	4·6	(3·3)	(1·4)	(0·0)	(0·5)	
*	*	*	*	*	*	*	(10·0)	(7·6)	(5·3)	(7·4)	(1·9)	(3·6)	(2·9)	(1·6)	(0·9)	
*	*	*	*	*	(6·3)	*	(6·0)	(6·1)	(3·0)	(5·0)	(2·6)	(2·3)	(2·8)	(0·8)	(0·2)	
*	*	*	*	*	*	*	(3·8)	*	(2·4)	*	(3·6)	(3·8)	(0·0)	(0·6)	(1·1)	
*	*	*	*	*	*	*	*	*	(5·8)	(6·9)	(5·1)	(5·2)	(2·2)	(1·0)	(0·2)	
*	*	*	*	*	*	*	(4·0)	*	(1·6)	*	(2·4)	(1·7)	(0·6)	(0·0)	(0·0)	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	(0·0)	(0·0)	
*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	

han 100 families.

, no probability having been calculated, the respective place is marked by an asterisk.

mn, the dotted one those of each line.

To face p. 832.

s).

46–47	47–48	48–49	49–50
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
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*	*	*	*
*	*	*	*
*	*	*	*
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*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
*	*	*	*
(1·9)	*	*	*
(0·4)	(0·7)	(0·0)	*
(0·4)	(0·7)	(1·9)	*
(2·0)	(0·5)	(0·0)	*
0·7	(2·1)	(0·0)	(0·0)
(0·3)	(1·3)	(0·0)	(0·0)
(1·0)	(0·6)	0·1	(0·0)
(0·6)	(2·0)	(0·3)	(0·0)
0·4	(0·8)	0·0	(0·0)
(0·3)	(0·2)	(0·0)	(0·0)
(0·5)	(0·9)	0·0	(0·0)
(0·9)	(0·0)	(0·3)	(0·0)
(0·2)	(0·9)	(0·0)	(0·0)
(1·1)	(0·0)	(0·0)	(0·0)
(0·2)	(0·5)	(0·4)	(0·5)
(0·0)	(0·0)	(0·0)	(0·0)
(0·0)	(0·0)	(0·0)	*
*	*	(0·0)	(0·0)

curves of the one system (representing the change of the fertility produced in a given maternal age by the advancement of the paternal age) are obtained by reading the birth probabilities as they follow one *next* the other in the lines of Table I.; these same elements read in the vertical direction of the columns, that is, as they follow one *under* the other, furnish the other system of curves (viz., the change of paternal fertility according to the change of maternal age). As there nowhere exist similar observations, we cannot enter into international comparisons, but must restrict ourselves to our own observations.

ABSTRACT Tables of Bigenous Natality (rough figures).

A. SPECIFIED Maternal and Cumulated Paternal Age.

Mother's age.	Father's age.						
	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.
20–21	**38·2**	30·0	(32·7)				
21–22	**45·7**	36·5	32·0				
22–23	**40·9**	36·2	35·2	(21·9)			
23–24	**41·8**	33·1	28·6	(20·4)			
24–25	**38·2**	31·1	30·1	(25·0)	(19·4)		
25–26	**35·6**	31·2	27·5	(27·8)	(18·6)		
26–27	**33·9**	31·1	27·4	21·1	(18·5)		
27–28	**33·2**	30·8	24·5	17·9	(16·8)		
28–29	**30·9**	30·2	24·7	20·5	(19·3)		
29–30	**36·3**	30·7	26·6	22·7	(20·3)	(20·2)	
30–31	**25·0**	23·6	21·8	16·7	14·4	(14·8)	(6 0)
31–32	**25·5**	23·0	25·1	19·7	15·2	10·8	
32–33	**27·1**	24·6	22·3	16·5	15·3	(18·5)	
33–34	**26·8**	21·3	22·1	17·4	14·7	(10·6)	(11·5)
34–35	**(25·9)**	18·4	21·0	17·0	11·9	9·8	(11·9)
35–36	**(21·2)**	19·9	19·4	14·0	10·9	10·9	(10·4)
36–37	**(23·9)**	17·8	18·9	17·4	12·5	11·5	(6·8)
37–38	..	**19 2**	17·2	16·6	12·3	12·6	(9·7)
38–39	**(17·1)**	**17·2**	13·5	14·4	8·6	7·3	5·6
39–40	**(22·0)**	(16·8)	17·5	16·1	10·8	9·9	(7·6)
40–41	..	(10·2)	**12·4**	10·6	8·5	4·9	3·1
41–42	..	(10·2)	**12·0**	**9·7**	7·8	5·9	(5·1)
42–43	..	(3·9)	5·6	**6·4**	4·6	3·3	3·2
43–44	..	[0·7]	[5·5]	4·6	4·2	3·4	3·3
44–45	..	(3·9)	(2·5)	3 8	2·8	2·0	0·7

(The maximum of each *line* is marked by heavy type.)

Following the curves formed in the horizontal axis, we see that even the uncorrected

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and also (4) with the specified one. In all these four series of curves the age of the father formed the fixed point: the curves show for a fixed paternal age the changes of natality according to the change of the wife's age. The same elements of probabilities form four other series of curves if we change the fixed point, that is, if we observe the course of the curve if with a given maternal age that of the father changes subsequently.

rough figures form most regular curves, which—between the most important part of the mother's life, that is between 20 and 40 years—are at their highest point (marked in heavy type) at the outset, and thenceforward fall rapidly. Thus, at this period of life, the mothers acquire the highest degree of natality, *accessible to their age*, with young fathers, not yet 30 years of age, whilst at a higher age, mothers ought to prefer husbands between 35–40 and even between 40–45 years.

B. Specified Paternal and Cumulated Maternal Age.

Age of the Father.	Age of the Mother.					
	Under 20.	20–24.	25–29.	30–34.	35–39.	40–44.
24–25	**(47·9)**	36·3	27·0	(19·1)		
25–26	**(49·1)**	43·0	30·8	(33·5)		
26–27	**(45·5)**	42·0	32·4	21·3		
27–28	**41·7**	39·5	32·2	24·3	(23·7)	
28–29	**(46·2)**	38·0	35·1	23·2	(18·9)	
29–30	(39·4)	**42·6**	35·7	30·1	(24·6)	
30–31	**(33·9)**	**34·0**	32·6	22·1	19·7	(8·3)
31–32	**(44·7)**	32·8	30·5	22·8	16·9	(10·0)
32–33	**(48·3)**	37·4	32·3	24·9	17·6	(6·4)
33–34	**(36·0)**	29·7	30·6	21·3	19·9	(5·6)
34–35	..	**30·1**	26·8	22·5	18·1	(8·4)
35–36	..	**31·3**	27·3	23·7	18·9	(6·6)
36–37	..	**32·6**	26·5	23·2	16·4	9·0
37–38	..	**30·2**	26·0	23·1	18·4	7·3
38–39	..	**27·0**	23·1	18·5	16·4	7·6
39–40	..	**(35·8)**	26·3	23·9	18·3	11·3
40–41	..	**(28·2)**	19·1	16·7	17·2	7·5
41–42	..	**(25·6)**	21·5	19·7	16·0	8·5
42–43	..	**(28·0)**	23·5	18·7	16·0	9·1
43–44	..	17·4	**25·0**	14·2	14·3	8·0
44–45	..	18·1	**21·0**	16·5	13·5	6·9
45–46	..	(16·0)	**18·5**	14·4	11·8	6·1
46–47	..	..	**17·1**	13·1	9·9	6·1
47–48	..	..	**(24·5)**	15·2	11·7	6·3
48–49	..	..	**(18·4)**	13·8	11·0	4·1
49–50	..	..	**(18·9**	13·6	9·0	4·9
50–51	..	..	..	15·0	9·6	3·9
51–52	..	..	[13·3]	[10·9]	12·9	3·8
52–53	..	..	..	[13·5]	11·1	3·9
53–54	..	..	..	[14·2]	10·0	3·8
54–55	..	..	..	[8·1]	6·7	3·0
55–56	..	..	..	(13·5)	(7·2)	2·6
56–57	..	..	..	(10·9)	(8·4)	5·1
57–58	..	..	..	(11·0)	(5·9)	1·9
58–59	..	..	..	..	(8·9)	(2·8)
59–60	..	..	..	..	(7·6)	(0·9)

(The maximum of each *line* is marked by heavy type.)

Here also the horizontal curves are regular enough. They show no up-and-down, but a constant course. We see that the males, under 30 years, reach the relative summit of their natality, that is, the highest degree *which is accessible to their* *age*, with wives under 20 years; those between 35 and 45 ought to choose wives between 20 and 25, and those of the age of 45–50 years, wives between 25 and 30.

But if we seek, instead of the highest relative natality, the highest absolute one, we see that—with the exception of the lowest ages—this is reached where both parents are young, that is where mothers under 25 years are married to husbands under 35 (compare the "Tabellogram," Plate 30). For these cases the natality does not sink below about 35 per cent., but frequently surpasses 40 per cent. If one of the parents is five years older, the natality declines to 32–37 per cent.

The weakest natality is to be naturally expected at the end of the reproductive period. If we mark as cases of weak fertility those where the natality is lower than 15 per cent., we see that nearly all the families where the mother is above 40 years belong to this class; besides that, also those where the mother is between 30 and 40, but the husband is above 45. That section of life which lies between these two limits presents the stratum of middle natality, between 15 and 27 per cent.

All these combinations may be seized in the easiest way by glancing at the graphic "Tabellogram," where, in the portion marked "quinquennial recapitulation," these three groups are separated by limits drawn on the diagram. In the following enumerations, we quote the numerical values of the quinquennial probabilities, adding the same values for Norway for 1874–76. (As for the meaning of the Norwegian values and the manner these were constructed, compare p. 797.)

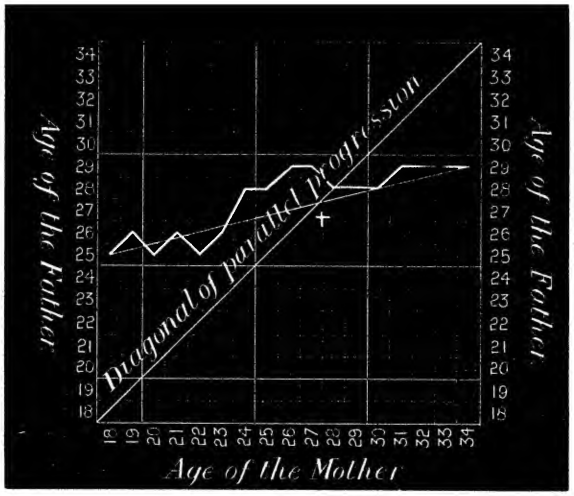
Probability of Annual Births in Norway and in Budapest, according to the (Quinquennial) Age of the Father and of the Mother respectively.

Age of the Father.	Age of the Mother.													
	Below 20 years.		20–24.		25–29.		30–34.		35–39.		40–44.		45–49.	
	Norway.	Budapest.	Norway.	Budapest.	Norway.	Budapest.	Norway.	Budapest.	Norway.	Budapest.	Norway.	Budapest.	Norway.	Budapest.
Years.														
20–24	..	(48·0)	53·4	35·0	48·9	27·3	..	(22·8)						
25–29	..	44·2	50·3	40·7	45·1	33·9	40·1	25·8	..	22·1	..	(16·0)		
30–34	..	40·4	52·6	33·2	42·4	30·8	37·2	22·7	32·8	18·4	19·2	7·4	..	(1·8)
35–39	..	(35·6)	..	31·1	41·3	26·0	34·6	22·3	31·7	17·5	19·7	8·7	4·6	0·8
40–44	..	..	..	25·0	39·2	21·4	33·1	17·3	29·4	15·7	19·9	8·0	4·9	1·3
45–49	..	..	..	(19·7)	..	18·9	32·0	14·1	27·5	10·8	17·1	5·6	4·6	1·1
50–54	..	..	..	(22·2)	..	(20·2)	..	12·5	..	10·2	..	3·7	3·9	0·4
55–59	..	..	..	..	..	(15·8)	..	11·2	..	7·6	..	3·0	2·6	0·3

9. *Curves of Greatest Relative Natality.*

In the preceding chapter we have touched upon the difference between the absolute and relative maximum of bigenous natality. The absolute highest natality, that is, the highest *isogens,* are to be found where both parents are young: the mother some years below or above 22, the father about 25–30 (compare the red squares in the "Tabellogram"). But besides this, each paternal and each maternal year possesses *its own* relative maximum, determined by a certain age of the other half. If in the bigenous table we connect these different points of greatest paternal or maternal natality, we obtain the following curves (established on the corrected figures, see Table III.), which we call *curves of greatest relative natality.* The investigation of these curves will lead to some new and interesting theses.*

A. *Curve of Greatest Maternal Natality (showing which Paternal Age corresponds best to each Year of Age of the Mother).*



We learn by this diagram—

1. That the period of male life out of which the women between 18 and 34 years can make their best choice includes only five years.

2. That the wives of all these ages have the greatest chance to become mothers with husbands between 25 and 30 years.

3. Consequently that the women under 28 years ought to choose older husbands, whilst those above 28 years younger ones than their own age. (In the diagram the turning point is marked by a cross; the women at the left side of the cross ought to prefer older, those at the right side younger husbands. The summits of natality stand for the first part above, for the second below the diagonal representing the curve of parallel progression for the couples of the same age.)

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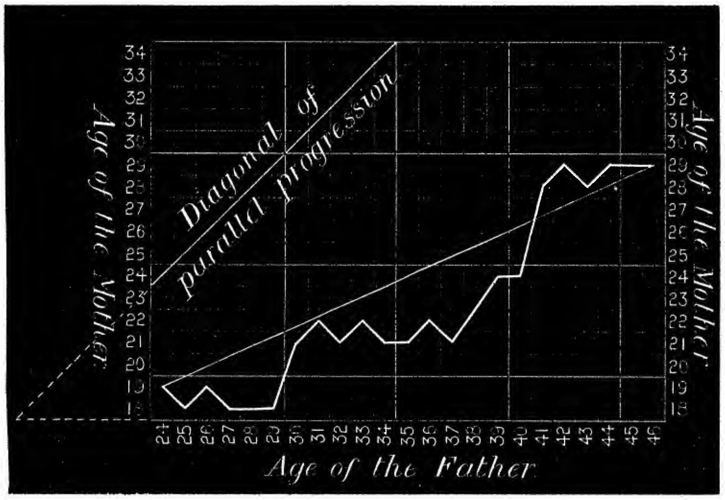
* For the rough figures the same curves have been represented in Table II. also.

B. *Curve of Greatest Paternal Natality* (*showing which Maternal Age corresponds best to each Year of Age of the Father*).



The course of the paternal curve shows remarkable differences. We see—

1. That the range of the most fitting female period is sensibly larger (11 years) than the most fitting male period for the wife (5 years).

2. That the husbands between 24 and 46 years have the greatest chance of becoming fathers with wives between 18 and 29 years.

3. That at all these ages, in order to have the greatest chance of offspring, the fathers ought to be older than the mothers. (The age of the mother with whom greatest fertility is reached stands everywhere at a lower level than shown by the diagonal.)

4. That this age difference rises with the age of the fathers; for the husbands between 24 and 30 years, it is 5–11, but at the age of 40, 16 years. But let us here observe, that in the higher ages the difference must necessarily grow, as the female generative power expires sooner than the male one. Thus, for instance, males at 45 may select wives ten years younger, but males at 60 are obliged to go farther back than ten years, as with women of 50 years they would have no chances at all.

Thus we may deduce the truth that, in order to secure the possible greatest fecundity, *females ought to select in their younger years older husbands, and in advanced ages younger ones, but that the males ought to select always younger wives;* further, that the husband may be even seventeen years older than the wife, but the age of the latter can surpass the age of the husband only by five years, and also that only if she is above 30 years.

These two assertions seem to involve a contradiction. It is obvious that complementary terms stand in an inverse relation one to another: if the natality of the male is greater than that of the female, that of the female is smaller than the other; if the bridegrooms are older than the other half, the brides are younger than the bridegrooms, &c. Thus one would suppose that, if females over 30 ought to prefer younger husbands, males of a certain age ought to select older women. But these two terms are not complementary in this sense: therefore because wives over 35 attain their greatest natality with husbands of 30, it does not follow that husbands of 30 ought to select wives of 35 in order to obtain *their own* greatest natality. These two relative maxima of natality are quite independent of one another.

This kind of curves gives occasion to some analytical remarks which are perhaps not entirely without interest.

The discussion of the preceding diagrams offers a special difficulty. One is accustomed to judge on the greater or smaller power of a force by the ascension or the decline of the curve, that is, by the height of the ordinates. But in the present case the ascension or decline of the curve is of quite another signification. So, for instance, in the diagram B, the lowest level of the curve is found with fathers of 25, the highest with those of 45; but the natality of these latter is not higher, but sensibly lower, amounting to 16·1 per cent., whilst that of the other is 48·5 per cent. The cause is that, in the common diagrams, one of the two axes—in general the vertical one—is devoted to the measure, so that the representation of the observed facts follows one axis only. In the above diagrams both axes refer to the phenomenon observed, thus the height of the ordinates does not signify the height of the measure. It requires some effort on the part of the reader accustomed to the common statistical diagrams to keep in mind this special nature of diagrams on two axes.

Now let us look on which kind of curves would arise according to the different possible conditions, To distinguish between the two ages, let us name that which follows the abscissæ, the determinated, the other the determinating.

The following conditions are possible:—(1) the greatest natality is quite independent of the age of the other consort; or (2) the natality of the determinated sex is bound to a certain year of the determinating one; or (3) to a younger; or (4) to an older age of it.

If the age of the determinating sex is without any influence, the curve of greatest natality could show no regular course. Now, as this curve shows a most surprising regularity, there can be no doubt that the causal connection exists.

Passing to the positive cases, the first of them, for instance, if males of all ages would produce the most children exclusively with females of 18 years (in which case, the female sex is the determinating) this would lead (in the diagram B) to a straight line, going parallel with the abscissæ. In the second case, that is, if, in order to obtain the highest possible natality, the advancement of the determinated age would require an always younger age of the determinating age (inverse relation), the curve ought to follow a declining direction, and in the contrary third case (direct relation) an ascending one.

Thus the three possible positive cases find their analytical representation in the following curves. The curve of the determinated age is:—

(1) — or a straight horizonal line.
(2) ╲ or a declining line.
(3) ╱ or an ascending line.

We see that nature proceeds in the third way. The course of the determinated and that of the determinating age is an ascending one, that is, shows direct relation. Thus we can restrict ourselves exclusively to enquiring into the varieties which these ascending curves can show.

We agreed that both ages, the determinated and the determinating, have to advance. But according to the different speed of this advancement, three cases are possible: (*a*) the advancement is strictly parallel; (*b*) the determinating age rises with accelerated, or (*c*) with retarded speed. (The same cases are possible for the inverse relation too.)

In the first case, each advancing year of age of the one consort ought to direct the relative climax also with one year's step in the age-ladder of the other consort; if, for instance, the climax for males of 25 is obtained with wives at 20, those of 26 ought to select wives of 21, those of 40 wives of 35. In this case, the distance of age is always the same, and the geometrical representation of this law would produce a straight line inclined to the abscissæ at an angle of 45°. (The diagonals in the diagrams A and B, represent that special case of parallel progression where both parents are at the same age.)

In the second case, if the velocity of the determinating age is greater than that of the determinated, the angle will be wider than 45°. If, for instance, in the diagram A, with each year's advancement of the maternal age that of the husband's rises with 2 years, we shall have after 5 years, the age distance increased to 10 years. In the opposite third case the angle is smaller than 45°. We see that nature follows this latter way.

In order to obtain a schematic image of these mutual movements, let us change the oscillating line of the curve into a straight one uniting the point of departure and the terminus point by a straight line (as done in the diagrams A and B). Thus we are enabled to measure the mean inclination of the curve by the wideness of the angle, this furnishing thus the simplest measure for characterizing the divergences of the male and female curve.*

This average-line forms with the abscissæ, and with the last ordinate, a right-angled triangle. If the advancing of the ages of the two consorts were the same (case of strict parallelism), the horizontal and the vertical cathetus would be of equal length, and thus the hypotenuse would be inclined at 45°. The shorter the vertical cathetus, the narrower the angle—that is, the smaller that age-stratum out of which the determinated sex may select his consort in order to obtain the greatest relative natality. Now we find that this angle is for the female curve of $14\frac{1}{6}$°, for the male of $24\frac{1}{3}$°, that is, the male shows a selecting latitude which is, in the average, $\frac{2}{3}$ time greater than that of the females.† Thus, it is possible to characterize the general average course of these complex relations by the simple indication of the degrees of an angle. By this selecting latitude we ought not to understand the known social fact, that in the actual state of society, the right of choice is, in fact, on the side of the male, but that latitude which is required by nature, the limits of ages between which, according to the physiological disposition of the human constitution, each of the two sexes may make its choice in order to obtain the greatest fecundity.

With different nations this physiological angle may be different, as, for instance, the angle of Camper, or any other anthropometrical measurement. If such observations are established also for other populations, it will present a special interest to enquire what is the order of each nation, if ranged according to the wideness of its angle.

10. *On the Best Age Distance and on the Best Marriage Age.*

As, in consequence of the structure of the diagrams A and B, it is not possible to judge of the age distance immediately by the eye, that is by the length of the ordinate, we ought to look also for another manner of graphical representation. Thus, the diagram B, for instance, does not inform us by mere sight where is to be found the greatest latitude between the age of father and mother. This maximum, which in the diagram can be established only by subtracting the age on the ordinate from that on the abscissa, falls at the paternal age of 39. To make these distances visible, we want a diagonal of strict parallel course for that special case where the paternal and maternal age is the same. This imaginary diagonal is drawn for its whole length in the diagram A, whilst only a part of it could find a place in the diagram B. The difference of age is now given by the number of unities (squares), which separate the top of the ordinate from the diagonal. Thus, for instance, at the paternal age of 34 the relative maximum is obtained with mothers of 21 years, that is, at a minus distance of 13 years. This distance is shown by the space between the top of the ordinate (21), and the diagonal (34).

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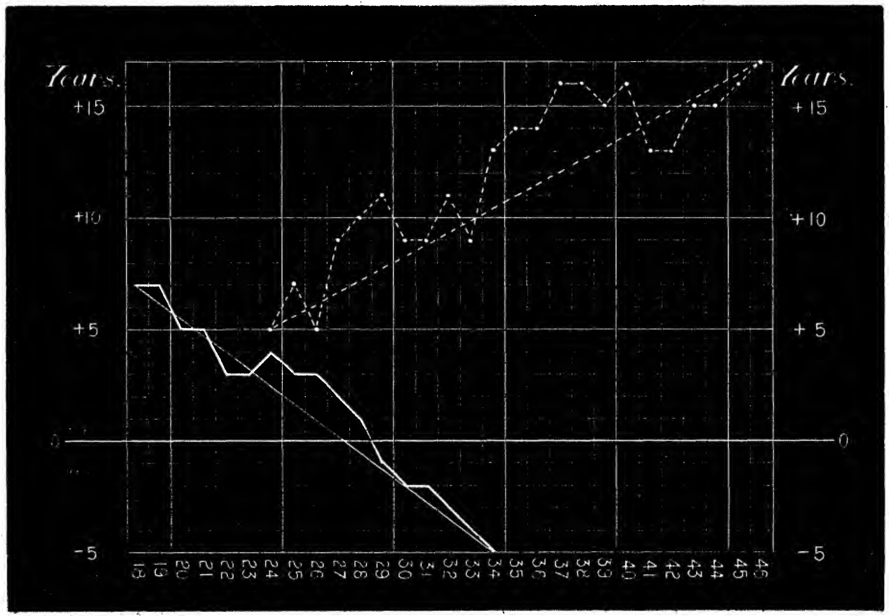
* The kind of adjustment used above is undoubtedly a very rough one; but in the present case, where we have to do only with two curves of one city, and where the chief intention is more to characterize the method than to please by circumstantial calculations, I allowed myself to follow the easiest way. It is also probable that, instead of one single average, we ought to establish different ones, according to the different periods of life. Thus, for instance, at the Diagram A, we see that the angle changes at the period of 24 to 29, of 30 to 37, and of above 38 years of the paternal age.

† Taking into account the circumstance of unequal length of the male and of the female period of fecundity, we might finish the paternal curve two or three years sooner; but this would not sensibly affect the result of the calculation.

With regard to the great importance of this question, the answer to which might be of service in the choice of a companion for life, we beg to be allowed to penetrate somewhat deeper into this problem.

We place here a third diagram, which shows for each year of age of the male or of the female, by how many years the husband's age should exceed that of the wife in order to secure the greatest chance of offspring.

Diagram C. *Best Age Advantage of the Husbands.*



The curve shows for each year of age how many years the father ought to be older.

The full line shows the age difference of the father if the age of the mother is given; the dotted line, if that of the father is given.

Conformably to the results already communicated, we see that, according as the age of the mother progresses, the age advantage of the father ought to become always less. Thus, the best age advantage of the father is

with mothers of 18 years	. . . . .	7 years above the age of the wife,
,, ,, 20 ,,	. . . . .	5 ,, ,, ,, ,, ,,
,, ,, 25 ,,	. . . . .	3 ,, ,, ,, ,, ,,
,, ,, 30 ,,	. . . . .	2 ,, ,, ,, ,, ,,
,, ,, 34 ,,	. . . . .	5 ,, ,, ,, ,, ,,

But, on the contrary, with the progress of the father's age his age advantage ought *always to increase.* Thus, the best advantage of age for the father is

at the age of 25	. . . .	6 years above the age of the wife,
,, ,, 30	. . . .	9 ,, ,, ,, ,, ,,
,, ,, 35	. . . .	14 ,, ,, ,, ,, ,,
,, ,, 40	. . . .	16 ,, ,, ,, ,, ,,
,, ,, 46	. . . .	17 ,, ,, ,, ,, ,,

Of course, such investigations ought to be repeated on greater scales, before we could venture to offer any definitive advice on this question, which is of so serious influence on the happiness of the individual and the development of mankind.

By the preceding we learned that, in order to obtain greatest fecundity, each of the two sexes requires a specific age distance on the side of the other consort, that, consequently, the obtaining of the possible maximum is, so to say, hindered if the age of the other half is not the right one. Now, could we not infer that in those cases where the age of *both* parents corresponds to the best distance, the fecundity ought to be the greatest, and that, consequently, this age combination ought to be regarded as the most fitted for procreation ?

If we accept this reasoning, we ought to search for combinations where the positive age difference of the one consort is equal to the negative of the other. These cases can be simply read from the diagram C by inspection. We see that the positive age distance of the father equals the negative of the mother at the following ages—

Father 24 or 26 and mother 20,
,, 25 ,, 18 or 19.

Thus—if we do not take into account the oscillations of the two curves caused manifestly by faults of observation—the two lines would meet at the section between 18, 19, and 20 years of female, and 24, 25, and 26 years of male life.

Therefore we dare pronounce—though, in consequence of the importance of the question, not without some hesitation—the conclusion, *that the best chances of prolification are offered by the couples where the woman is of* 18–20 *years of age and the husband of* 24–26 *years.* But we ought never to forget that we are here always dealing with the *actual* natality of married couples and not with the *physiological* fertility.

Besides this, the thesis needs not only to be justified by still more and numerous observations of other countries, but requires also to be corrected by the circumstance that greatest fecundity is not equal to greatest health of the children. As for this latter point I had occasion to make observations on the influence of the parental age on the mortality of children. The results which I obtained in this enquiry seem to advocate deferring the time of marrying one year beyond the limits mentioned before.*

Let us finally enquire in what degree the observed facts correspond with the consequences deduced from the statistics of the age differences. We find in our table of natality the following figures for the couples between the quoted limits of age and for the children born in those families in four years :—

Father 24–25 and mother 18, 19, or 20	87 families	with 148 births,
,, 25–26 ,, ,, ...	153 ,,	262 ,,
,, 26–27 ,, ,, ...	174 ,,	346 ,,
Total .	414 ,,	756 ,,

or yearly 189 births, giving a natality of 45·7 per cent.

Looking at the table of natality (rough figures†), we shall see that there are only two age combinations more (referring to at least 100 families) where the natality is so high, namely :—

Father of 26 years with mother of 21 years (46·8 per cent.),
and the ,, 28 ,, ,, ,, 23 ,, (45·8 ,,).

Thus it seems possible that an enquiry established on a larger scale would perhaps extend the limit of the most suitable age for the bridegroom and for the bride by 2–3 years.

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* See the author's report: "Ueber den Einfluss des elterlichen Alters auf die Lebenskraft der Kinder," read at the London International Congress of Hygiene and Demography (vol. 10, p. 262), or in the 'Jahrbücher f. Nationalökonomie u. Statistik,' 3rd Series, vol. 4, p. 518.

† We referred above to the probabilities as given in the table of rough figures, because of the adjusted table not containing the absolute but only the relative numbers, and thus furnishing no information about the weight of the observations. Consulting, also, the adjusted table, we find that the probabilities of births are :—

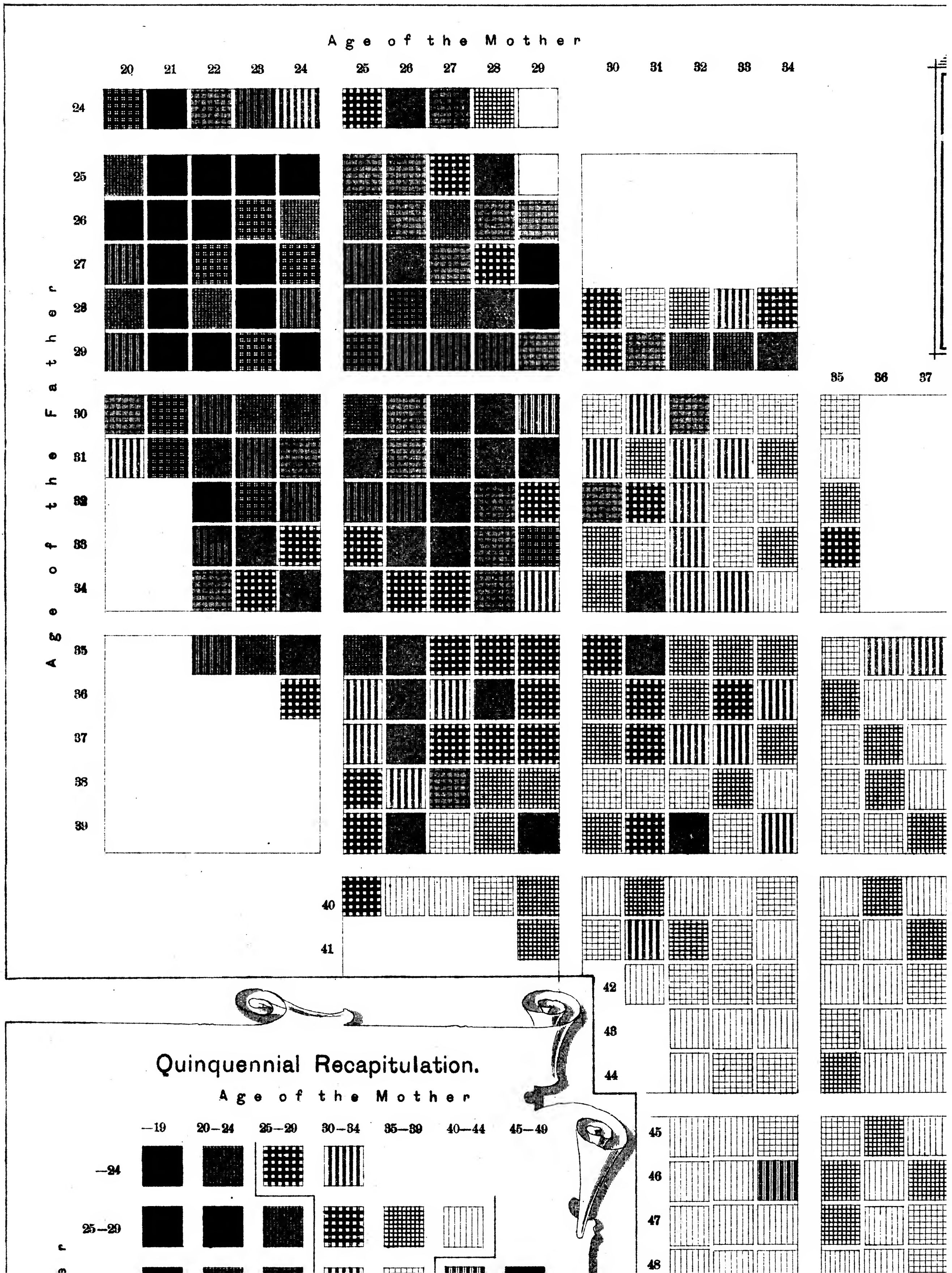
For the father of 24 years with mother of	18	?
,, ,, ,, ,,	19	46·6,
,, ,, ,, ,,	20	44·5,
,, 25 ,, ,,	18	48·5,
,, ,, ,, ,,	19	46·6,
,, ,, ,, ,,	20	47·0,
,, 26 ,, ,,	18	46·3.
,, ,, ,, ,,	19	48·1,
,, ,, ,, ,,	20	45·5,

that is in the average 46·6, which probably is not reached even by one single other age combination.

Tabellogram.

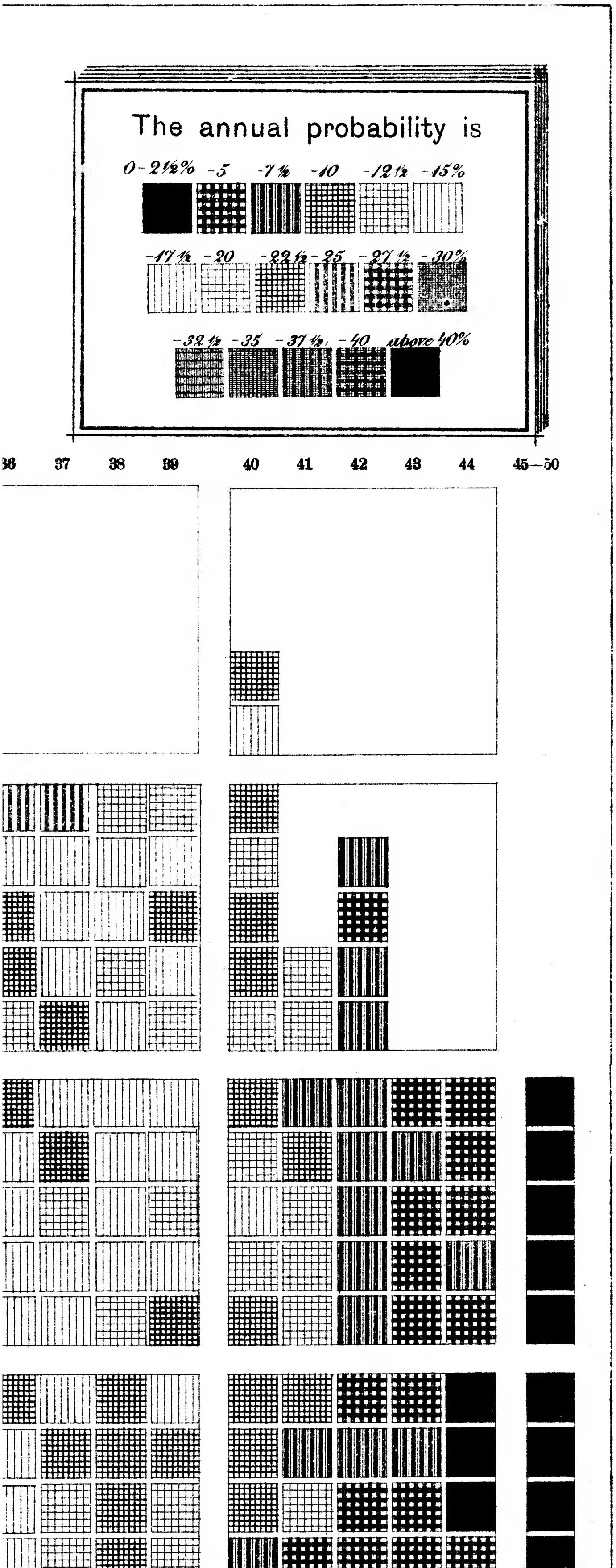
Bigenous Table of Natality.

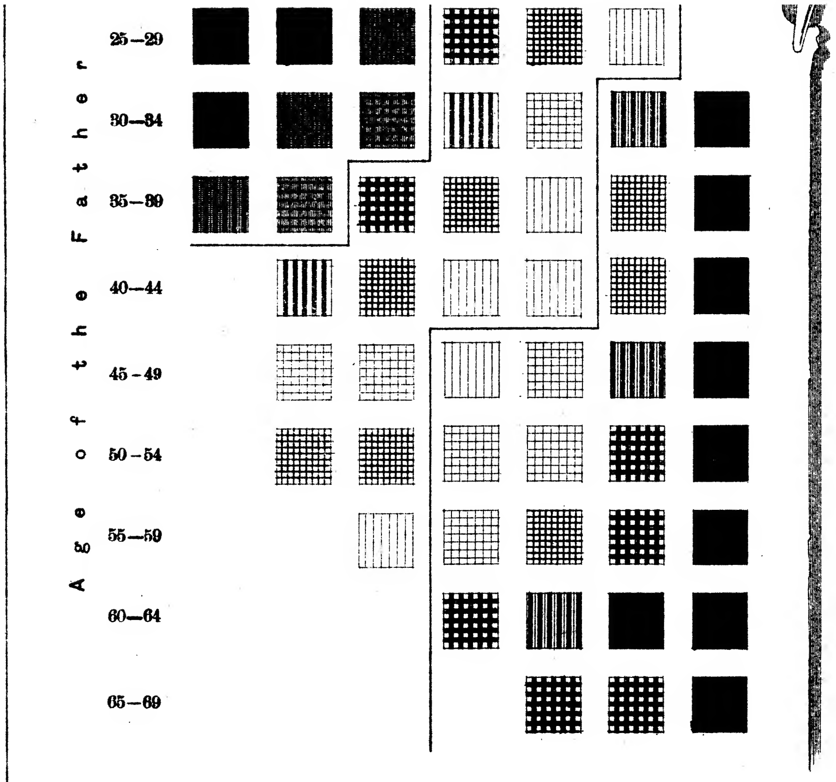
Annual probability of birth for marriages of the following a



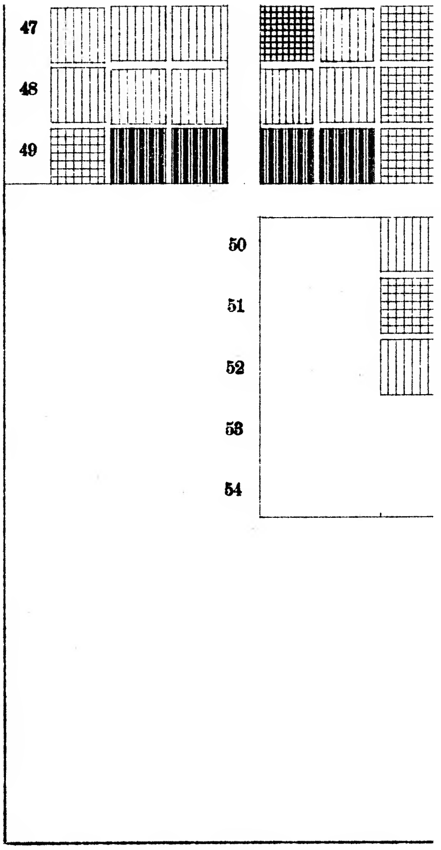
ity.

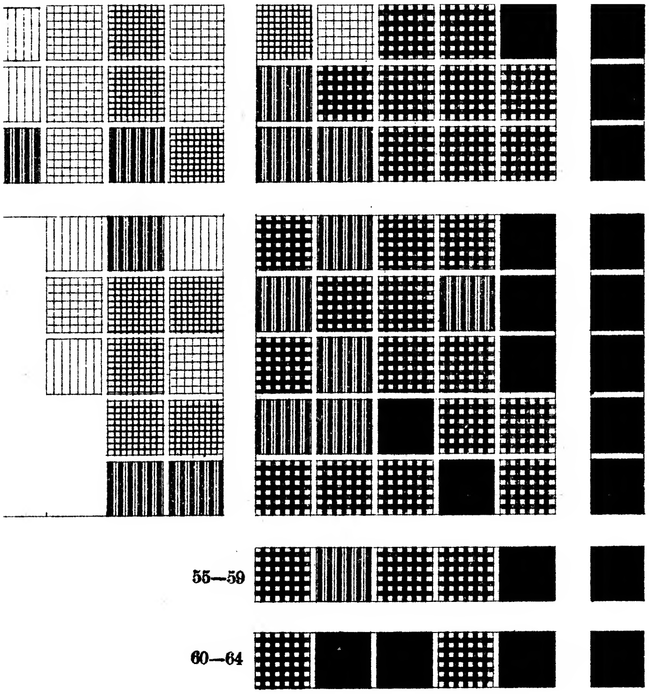
ving age combinations:





Körösi Table of Natality.





PESTI KÖNYVNYOMDA R.T. BUDAPEST (HOLD-UTCZA 7.)

IV. Isogens.

11. *The Use and the Construction of Isogens.*

In his paper on the Budapest Table of Natality,* Mr. **Francis Galton**, after having smoothed the rough figures, proceeded by the method of contours, connecting all the age combinations which show the same degree of natality. The curves obtained—*ad normam* of isotherms, isobars, isohypsos, &c.—he named *isogens*. If these curves were established on the rough material, they would show such an irregular course, so many ups and downs, that we should obtain no continuous isogen curves, but a mass of concentric lines, which, instead of helping, would rather confuse the beholder. Thus, on one hand, the rough figures of natality did not seem to me fit for the construction of specified isogens (referring to the combination of the single years of age); and, on the other hand, I thought that my own observations, embracing only 47,000 births, were not sufficiently numerous to furnish—after a division into 1105 age combinations!—masses which are weighty enough to endure the somewhat delicate operation of adjustment. For the graphical representation of the rough age-combinations I preferred, therefore, instead of the plan of isogens, the method of graphic representation which I have introduced under the term *Tabellogram* (see the Plate facing the title).† But as the wish had been expressed that isogens should be constructed, I afterwards undertook this enquiry also.

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* "Results derived from the Natality Table of Kőrösi by employing the Method of Contours or Isogens" ('Roy. Soc. Proc.,' vol. 55).

† The usual statistical diagrams give us, in one of their axes, the magnitudes of the phenomenon to be observed (for instance, the life-table, the single years of age), and in the second dimension of the drawing, the degrees of the scale. In the present case we need both dimensions, namely, the horizontal axis of the Tabellogram to represent the years of age of the mothers, and the vertical that of the fathers, so that, in order to make sensible the varying level of natality, we ought to apply a third axis, that is, we ought to pass from the diagram in the plane to the body of a stereogram constructed in the three dimensions of space.

It is for such cases that Perozzo invented his stereograms, and his merit is further raised by the fact that he used this new method of representation in order to amplify the province of the calculation of probabilities in general. But as such relief stereograms are not applicable to books, we have to look for other kinds of graphical designs. Such are, for instance, isobars, isotherms, &c., where all the places, at the same level of the scale, are connected by a line, and furnish an example how the representation of a third dimension becomes possible in statistical diagrams. Such drawings ought to be classed amongst the "cartograms," whose basis is supplied by a geographical map. Perozzo has adopted this system also for the representation of demographical facts, without any relation to their topographical distribution, that is, without referring to a geographical substratum. We arrive thus, as in the hypsometric maps, at lines of equal height. But such representations do not satisfy the fundamental requirement of *statistical diagrams*, that is, to show the change of the facts to the *eye* directly, in an immediate way, without appealing to a mental process, for instance, to the view of figures. This is not the case with isohypsos; one line is like the other, and thus we do not know by immediate sight, but only by inquiry of the figures, which height we have before the eye. By a single inspection we do not even know whether the concentric lines ought to represent a peak or a crater; it is

The general direction of the isogens is given by the fact that the highest is to be found where both parents are young, and the lowest where one or both are towards the end of the procreative period. If we were to regard the curved surface of the natalities as a hypsometric relief, we should say that this mountainous relief has its top in the north-west corner and the null-points in the south and in the east.

As the natality of the mothers begins nearly always immediately with its maximum, the horizontal passing of this mountain leads nearly continuously downwards. But the natality of the men rises till 24 years and begins to fall only from this point. Thus, if we step over the mountain from north to south, we have to cross the ridge

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only by a study of the figures inscribed against the curves that we learn if the central circle means the bottom of a hole or the top of a mountain, that is, if we have before us a rise or a descent of the curve. Consequently such drawings cannot be regarded as statistical diagrams. The difficulties are multiplied, if, as in the rough table of natality, the course of the curves is no regular one, and if each curve shows multiple climaxes. Under such circumstances the application of isogens would be of no help to the reader. This may be seen the easiest if one tries to connect in Table II. the squares of equal height by isogens. These considerations deterred me from the construction of isogens, and made me prefer the Tabellogram, which is really preferable if we deal with rough and irregular curves. But after the most interesting results obtained by Mr. GALTON with the aid of these isogens, I was bound to recognize the great importance of this method, and so I added the results obtained by this way in the following chapters.

As already mentioned, the method of isogens can be applied to our table of natality only after the smoothing of the curves. This troublesome preparation of the rough figures I owe to the kind co-operation of Dr. E. BLASCHKE (Vienna); the method employed is explained by him in the "Appendix" (p. 868, *et seq.*).

In the Tabellogram the equal levels of natality are marked by equal tints of colour; the equal heights can thus be recognized by the eye directly, and without any study of figures. The identical tints replace the design of isogens. As in a statistical table, each figure occupies also here a square. Those squares which show the greatest natality (that is, above 40 per cent.) are marked with the most intense carmine. This colour becomes subsequently lighter and lighter, till we arrive (by ten shades, which correspond to ten degrees of 2½ per cent. distance each), to that limit of 15 per cent., which we agreed to regard as the boundary of weak natality. The remaining portion of the Tabellogram is coloured black, and of six different shades, so that the blackest squares represent those age combinations where the natality varies between naught and 2½ per cent.

If in the Tabellogram we follow the single squares according to their vertical direction, we have before our eyes the course of maternal natality, changing with each year of age of the husband; following the horizontal direction we observe the change of the paternal natality, according to the change of the maternal age. The construction of this drawing answers thus that of a statistical table, which furnishes likewise two different things, according as we read it in the horizontal axis (line by line) or in the vertical one (that is, column by column). Our drawing also resembles the table, inasmuch as the periodical recapitulations can also be represented (see the "quinquennial recapitulation"). It is in consequence of this resemblance that I have called this kind of graphic representation, which takes its place between the two dimensional diagrams and the three dimensional stereograms, a *Tabellogram.*

It has been objected that the seventeen tints of colours I use are too few, and do not allow us to enter deeply into details. But this observation includes only a question of scale; if we use more colours we can represent more degress, whilst, if the degrees of a scale in a common diagram are too narrow, it may likewise become impossible to make sensible a larger number of differences.

caused by this elevation; having passed this ridge our way leads downwards, so that afterwards we pass subsequently the same levels when mounting. According to the greater or less steepness of the slope, the number of the points which stand on both sides of the slope, at the same level, is more or less numerous. In all these cases the isogens are returning ones, forming a kind of semicircle.

We obtain, even for the rough figures, pretty regular isogens if we restrict ourselves to dividing the bulk of observations only into greater, *e.g.*, quinquennial groups of age. The cumulative isogens constructed on the basis of these rough quinquennial figures are represented in the small table at the lower corner of Table III.

We see that the isogen of highest natality (that of 40 per cent.) shows a sudden return, and that with the following natalities the angle of return becomes greater and greater, that is, the curves become smoother. But as for their general direction they show always the same tendency (that is, from north-east to south-west). According to the advancement from younger fathers to older ones, they keep always towards the younger mothers, and form, in this direction, nearly parallel contours.

Passing in the following part of this chapter to the specified isogens constructed on the adjusted figures of the single age combinations, we must give a general caution, that all the following deductions hold good only so far as the bulk of observations which fall upon each single age combination are sufficiently numerous, and so far as we may thence conclude that the striking regularities which present themselves after the operation of adjustment represent the real effect of facts, and not the artificial effect of intentional smoothing.

The isogens have been constructed by me on the following method:—

If the probability for the single age combinations of the parents could all be expressed in whole numbers, we should have nothing more to do than to connect all the squares marked by identical figures. If further, we had to do exclusively with vertical or exclusively with horizontal curves, we should need simply to draw connected lines from the centre of one square to the centre of the other square showing the same probability. But, as both suppositions are not satisfied by the facts, we have to use interpolations.

Regarding the first circumstance, that the centre of a square is occupied, not by the whole degree, but by a mixed fraction, it follows that the point of the full degree must be looked for on another point of the axis of the square. Thus, for instance, the isogen of 37 per cent. must have its starting point between the ages of

$$\left.\begin{array}{ll} & 24\text{–}23^{*} = 37{\cdot}5 \text{ per cent.} \\ \text{and} & \\ & 24\text{–}24 \ = 35{\cdot}3 \quad ,, \end{array}\right\} \text{difference } 2{\cdot}2 \text{ per cent.}$$

To fix the place of this point, I divided the space between the centres of these two squares into 20 equal parts of 1 millim. each; the whole distance of the two squares being 2·2 per cent., each of the 20 millims. represents 1·1 per cent. To arrive from 37·5 per cent. to 37 per cent., I need to go backwards (towards the right) by 0·5 degree, that is, 4·5 millims. Thus I could fix here (the point *a* of the diagram on the next page) the starting-point of the isogen 37.

By this proceeding we could find the right point of each whole degree for each line of the table corresponding to the age of the fathers. Connecting these points by a line, we obtain the curve of the isogen.

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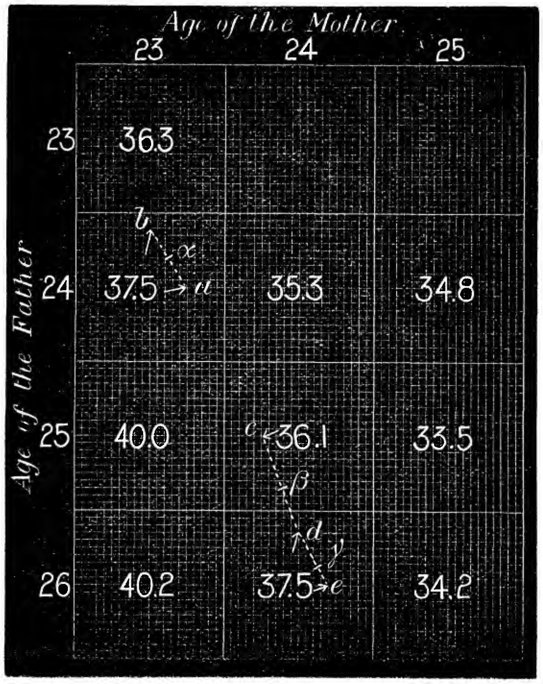
* The first figure will always denote the age of the father, the second that of the mother.

But we arrive, also, at isogens if we interpolate the space of the squares as they stand in the column of the mothers, one below the other. We obtain thus a table of isogens somewhat different to those constructed in the horizontal direction, but extremely similar one to another. If we wish to reduce these two kinds of curves to a common unitary expression, we may proceed in the following way:—I fixed first the place of the degree in question in the direction of the abscissæ, that is, in the direction of the horizontal line which goes through the centre of the square. Then I fixed the nearest place of the same degree in the vertical direction. Having thus obtained two places for the same value, I supposed the right place to be at the half distance between the two places, this point being regarded as the most probable, as being at the same distance between the two values. I passed then to the next following line of the paternal age, and fixing there in the same manner the second point of the curve, I connected the first and the second point by a straight line, and so on.

Example.—The place of 37 per cent. in the axis of the fathers of 24 years was fixed before at the point *a*.



But besides this horizontal interpolation there is possible also a vertical one, as in the column of the mothers of 23 years we find given for two neighbouring squares these two degrees: 36·3 and 37·5, between which there is also a point representing 37 degrees. Applying here also the interpolation as before demonstrated, we find that this degree falls on the point *b*. Having thus two places for the point of 37 per cent., *a* and *b*, we connect them by a straight line and fix the probable middle place of 37 per cent. at α in the midst of this auxiliary line. This α becomes thus the starting point of the isogen of 37 per cent. We advance now to the next line, that of the fathers of 25 years. Here the place of 37 per cent. is found to be at the point *c*, between 40·0 and 36·1. In the vertical direction the next point of 37 per cent. is between 36·1 and 37·5, at *d*. We draw the auxiliary line *cd*, fix the middle place of 42 degrees in the midst of it, at β, and obtain then, by uniting the two points α and β, the first section of the isogen of 37. The second section is found if we advance to the third line, where the point of 37 per cent. is found in the horizontal direction at *e*, between 37·5 and 34·2, whilst in the vertical it has already been fixed at d; the midst of the line de is at γ, and thus the second section of the isogen is represented by $\beta\gamma$.

If in the fixation of the starting point of a curve the nearest vertical value fell too far, we allowed ourselves to ignore it, and proceeded one or two steps only according to the horizontal interpolation. We proceeded in a corresponding manner if towards the end of the curve fixed points were to be found only in the one or in the other direction.

Those interpolations have been finished on a larger scale and then been reduced to that of the Table III.

12. *Isogens and Age Combinations.*

In his paper on the Table of Natality, Mr. FRANCIS GALTON communicated the ingenious observation that there can be found a general formula which answers with practical trustworthiness to the value of the natality for all those cases where the husband is not younger than his wife, and where the age of this latter is between 23 and 40 years: If we add the paternal and maternal age and the figure of the natality, we obtain a total which varies only between the narrow limits of 91 and 98 (restricting ourselves to the natalities above 15 per cent., the total is even included between $90\frac{1}{2}$ and 92, that is, corresponds in the mean to $91\frac{1}{4}$). If we denote the paternal age by p, the maternal by m, and the degree of natality by n, the formula is

$$m + p + n = 91\tfrac{1}{4},$$

and

$$n = 91\tfrac{1}{4} - (m + p);$$

that is to say, the natality can with satisfactory reliability be estimated to be equal to the difference between the age of both parents taken together and the number $91\frac{1}{4}$. Examples: What is the natality of a couple where the father is 30, the mother 25?

$$91\tfrac{1}{4} - (30 + 25) = 36\tfrac{1}{4}, \text{ instead of } 34{\cdot}2.$$

For a father of 35 and a mother of 30 years?

$$91\tfrac{1}{4} - (35 + 30) = 26\tfrac{1}{4}, \text{ instead of } 25 \text{ per cent.}$$

The strange character of this formula is a motive the more for enquiring into the connection between the relative ages and the degree of natality.

With this purpose we have abstracted from Table III. the Table IV., which shows in what age combination each isogen occurs. Thus this table teaches us at the same time how, with a change in the age of one parent, we should require to change the age of the other in order to maintain the same level of natality. Thus, for instance, the natality of 25 per cent. is obtained if a father of 31 years meets a mother of the same age. Now, as the father becomes older year by year, how has the age of the mother to change in order to secure the same natality? To obtain the answer we must consult Table IV.

TABLE IV.—Isogens, according to the Age Combination of Parents, showing at the same time the *total* and the *difference* of both ages.

Isogens of 1 to 10 per cent.

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	1 per cent.			2 per cent.			3 per cent.			4 per cent.			5 per cent.		
40	..	..	..	..	..	..	45	85	− 5	44	84	− 4	43	83	− 3
41	..	..	..	..	..	..	45	86	− 4	44	85	− 3	43	84	− 2
42	..	..	..	45	87	− 3	44	86	− 2	44	86	− 2	43	85	− 1
43	..	..	..	45	88	− 2	44	87	− 1	44	87	− 1	43	86	0
44	..	..	..	45	89	− 1	44	88	0	43½	87½	+ 0½	43	87	+ 1
45	..	..	..	45	90	0	44	89	+ 1	43	88	+ 2	43	88	+ 2
46	..	..	..	45	91	+ 1	44	90	+ 2	43	89	+ 3	42	88	+ 4
47	..	..	..	45	92	+ 2	44	91	+ 3	43	90	+ 4	42	89	+ 5
48	47	95	+ 1	45	93	+ 3	44	92	+ 4	43	91	+ 5	42	90	+ 6
49	47	96	+ 2	45	94	+ 4	44	93	+ 5	43	92	+ 6	41½	90½	+ 7½
50	46	96	+ 4	45	95	+ 5	43½	93½	+ 6½	42	92	+ 8	41	91	+ 9
51	46	97	+ 5	45	96	+ 6	43	94	+ 8	42	93	+ 9	41	92	+10
52	46	98	+ 6	44½	96½	+ 7½	43	95	+ 9	42	94	+10	41	93	+11
53	45½	98½	+ 7½	44	97	+ 9	43	96	+10	42	95	+11	41	94	+12
54	45	99	+ 9	44	98	+10	43	97	+11	42	96	+12	40	94	+14
55	45	100	+10	44	99	+11	43	98	+12	42	97	+13	39½	94½	+15½
56	45	101	+11	44	100	+12	43	99	+13	41	97	+15			
56	..	..	..	..	..	..	..	..	..	40	96	+16			
57	..	..	..	..	..	..	43	100	+14	40	97	+17			
	Mean	97·8	+6·17	..	93·7	+4·30	..	92·2	+4·81	..	91·4	+6·39	..	89·3	+5·69

	6 per cent.			7 per cent.			8 per cent.			9 per cent.			10 per cent.		
36	..	..	..	..	..	..	..	..	..	42	78	− 6	41	77	− 5
37	..	..	..	..	..	..	..	..	..	42	79	− 5	41	78	− 4
38	..	..	..	..	..	..	..	..	..	42	80	− 4	41	79	− 3
39	43	82	− 4	42	81	− 3	42	81	− 3	41	80	− 2	41	80	− 2
40	43	83	− 3	42	82	− 2	42	82	− 2	41	81	− 1	41	81	− 1
41	43	84	− 2	42	83	− 1	42	83	− 1	41	82	0	41	82	0
42	43	85	− 1	42	84	0	42	84	0	41	83	+ 1	41	83	+ 1
43	42	85	+ 1	42	85	+ 1	41	84	+ 2	41	84	+ 2	41	84	+ 2
44	42	86	+ 2	42	86	+ 2	41	85	+ 3	41	85	+ 3	40	84	+ 4
45	42	87	+ 3	41½	86½	+ 3½	41	86	+ 4	41	86	+ 4	40	85	+ 5
46	42	88	+ 4	41	87	+ 5	40½	86½	+ 5½	40	86	+ 6	39	85	+ 7
47	41½	88½	+ 5½	41	88	+ 6	40	87	+ 7	39	86	+ 8	38½	85½	+ 8½
48	41	89	+ 7	41	89	+ 7	..	..	..	39	87	+ 9	38	86	+10
48½	..	..	..	..	..	..	39½	88	+ 9						
49	40½	89½	+ 8½	40	89	+ 9	39	88	+10	39	88	+10	38	87	+11
50	40	90	+10	40	90	+10	39	89	+11	38½	88½	+11½	38	88	+12
51	40	91	+11	39	90	+12	39	90	+12	38	89	+13	38	89	+13
52	40	92	+12	39	91	+13	38	90	+14	38	90	+14	38	90	+14
53	40	93	+13	38	91	+15	38	91	+15						
54	39	93	+15												
55	38	93	+17												
	Mean	88·2	+5·82	..	86·8	+5·17	..	86·3	+5·77	..	84·5	+3·74	..	83·7	+4·26

TABLE IV. (continued).—Isogens, according to the Age Combination of Parents, showing at the same time the *total* and the *difference* of both ages.

Isogens of 11 to 15 per cent.

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	11 per cent.			12 per cent.			13 per cent.			14 per cent.			15 per cent.		
33	..	..	..	..	..	..	..	..	..	..	..	..	39	72	− 6
34	..	..	..	..	..	..	40	74	− 6	39	73	− 5	39	73	− 5
35	..	..	..	40	75	− 5	40	75	− 5	39	74	− 4	39	74	− 4
36	40	76	− 4	40	76	− 4	40	76	− 4	39	75	− 3	39	75	− 3
37	40	77	− 3	40	77	− 3	40	77	− 3	39	76	− 2	39	76	− 2
38	40	78	− 2	40	78	− 2	40	78	− 2	39	77	− 1	39	77	− 1
39	40	79	− 1	40	79	− 1	39½	78½	− ½	39	78	0	38½	77½	+ ½
39½	..	..	..	..	..	..	..	..	..	..	..	..	38½	78	+ 1
40	40	80	0	40	80	0	39	79	+ 1	39	79	+ 1	38	78	+ 2
41	40	81	+ 1	40	81	+ 1	39	80	+ 2	39	80	+ 2	38	79	+ 3
42	40	82	+ 2	40	82	+ 2	39	81	+ 3	38½	80½	+ 3½	38	80	+ 4
43	40	83	+ 3	39½	82½	+ 3½	38½	81½	+ 4½	38	81	+ 5	37	80	+ 6
43	..	..	..	..	..	..	..	..	..	37	80	+ 6	36	79	+ 7
43	..	..	..	..	..	..	..	..	..	..	..	..	35	78	+ 8
43½	..	..	..	39	82½	+ 4½									
44	40	84	+ 4	38½	82½	+ 5½	38	82	+ 6	36	80	+ 8	34	77½	+10
44	..	..	..	..	..	..	37	81	+ 7	35	79	+ 9	33	77	+11
44	..	..	..	..	..	..	..	..	..	34	78	+10			
44½	..	..	..	..	..	..	36	80½	+ 8½						
45	39	84	+ 6	38	83	+ 7	35	80	+10	33	78	+12	32	77	+13
45½	..	..	..	..	..	..	34	79½	+11½			..			
46	38	84	+ 8	37	83	+ 9	34	80	+12	33	79	+13	31½	77½	+14½
47	37½	84½	+ 9½	36	83	+11	34	81	+13	33	80	+14	31	78	+16
47½	..	..	..	..	..	..	..	..	..	..	..	..	30	77½	+17½
48	37	85	+11	35½	83½	+12½	34	82	+14	32	81	+16			
48½	..	..	..	..	..	..	33	81½	+15½						
49	37	86	+12	34	83	+15	32	81	+17						
49	..	..	..	33	82	+16									
50	37	87	+13												
51	37	88	+14												
52	37	89	+15												
	Mean	82·8	+5·21	..	80·8	+4·24	..	79·4	+5·22	..	78·2	+4·69	..	77·0	+4·62

TABLE IV. (continued).—Isogens, according to the Age Combination of Parents, showing at the same time the *total* and the *difference* of both ages.

Isogens of 16 to 20 per cent.

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	16 per cent.			17 per cent.			18 per cent.			19 per cent.			20 per cent.		
30	..	..	..	..	..	..	..	..	..	36	66	— 6	33	63	— 3
31	..	..	..	38	69	— 7	..	..	..	36	67	— 5	33	64	— 2
32	..	..	..	38	70	— 6	37	69	— 5	36	68	— 4	33	65	— 1
33	38	71	— 5	38	71	— 5	37	70	— 4	36	69	— 3	33	66	0
34	38	72	— 4	38	72	— 4	37	71	— 3	36	70	— 2	33	67	+ 1
35	38	73	— 3	38	73	— 3	37	72	— 2	36	71	— 1	33	68	+ 2
36	38	74	— 2	37	73	— 1	36	72	0	36	72	— 0	33	69	+ 3
37	38	75	— 1	37	74	0	36	73	+ 1	35	72	+ 2	34½	71½	+ 2½
38	38	76	0	36	74	+ 2	36	74	+ 2	35	73	+ 3	34	72	+ 4
39	38	77	+ 1	36	75	+ 3	35	74	+ 4	34	73	+ 5	33	72	+ 6
40	38	78	+ 2	36	76	+ 4	35	75	+ 5	33	73	+ 7	32½	72½	+ 7½
40	..	..	..	..	..	..	..	..	..	..	..	..	32	72	+ 8
40½	..	..	..	..	..	..	34	74½	+ 6½						
41	38	79	+ 3	36	77	+ 5	33	74	+ 8	32	73	+ 9	31	72	+10
41	..	..	..	35	76	+ 6	..								
42	37	79	+ 5	34	76	+ 8	32	74	+10	31	73	+11	30	72	+12
42	36	78	+ 6	33	75	+ 9	..	..	..	..	..	..	29	71	+13
42	35	77	+ 7	..	..	..	..								
42½	34½	77	+ 8	..	..	..	..	..	..	30	72½	+12½			
43	34	77	+ 9	32	75	+11	31	74	+12	29	72	+14	28	71	+15
43	33	76	+10	31	74	+12	..	..	..	..	..	..	27	70	+16
43½	32	75½	+11½												
44	31	75	+13	30	74	+14									
44	..	..	..	29	73	+15									
45	30	75	+15	..	..	..									
45½	29	74½	+16½	..	..	..									
	Mean	75·7	+4·84	..	73·7	+3·50	..	72·8	+2·65	..	71·0	+2·83	..	69·3	+5·53

TABLE IV. (continued).—Isogens, according to the Age Combination of Parents, showing at the same time the *total* and the *difference* of both ages.

Isogens of 21 to 25 per cent.

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	21 per cent.			22 per cent.			23 per cent.			24 per cent.			25 per cent.		
27	..	..	..	..	..	..	..	..	..	..	..	..	32	59	− 5
28	..	..	..	..	..	..	..	..	..	..	..	..	33	61	− 5
28½	..	..	..	..	..	..	..	..	..	..	..	..	34	62½	− 5½
29	..	..	..	..	..	..	..	..	..	34	63	− 5	34	63	− 5
30	35	65	− 5	34	64	− 4	34	64	− 4	34	64	− 4	33	63	− 3
30	..	..	..	..	..	..	..	..	..	33	63	− 3			
30½	..	..	..	..	..	..	..	..	..	..	..	..	32	62½	− 1½
31	34	65	− 3	33½	64½	− 2½	33	64	− 2	32	63	− 1	31	62	0
32	34	66	− 2	33	65	− 1	32	64	0	31½	63½	+ ½	31	63	+ 1
33	34	67	− 1	33	66	0	32	65	+ 1	31	64	+ 2	30½	63½	+ 2½
34	34	68	0	33	67	+ 1	32	66	+ 2	31	65	+ 3	30	64	+ 4
35	34	69	+ 1	33	68	+ 2	32	67	+ 3	31	66	+ 4	30	65	+ 5
36	34	70	+ 2	33	69	+ 3	31½	67½	+ 4½	30	66	+ 6	29	65	+ 7
37	34	71	+ 3	33	70	+ 4	31	68	+ 6	29	66	+ 8	28	65	+ 9
37½	..	..	..	..	..	..	30	67½	+ 7½						
38	33	71	+ 5	32	70	+ 6	29	67	+ 9	28	66	+10	27	65	+11
38	..	..	..	..	..	..	..	..	..	27	65	+11	26	64	+12
38½	..	..	..	31	69½	+ 7½									
39	32	71	+ 7	30	69	+ 9	28	67	+11	26	65	+13	25	64	+14
39	..	..	..	29	68	+10	27	66	+12						
39½	31	70½	+ 8½	28	67½	+11½									
40	30	70	+10	27	67	+13	26	66	+14	..	..	..	24	64	16+
40	..	..	..	26	66	+14									
40½	29	69½	+11½												
41	28	69	+13												
	Mean	68·7	+3·57	..	67·4	+4·90	..	66·1	+4·92	..	64·6	+3·42	..	63·3	+3·32

TABLE IV. (continued).—Isogens, according to the Age Combination of Parents, showing at the same time the *total* and the *difference* of both ages.

Isogens of 26 to 30 per cent.

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	26 per cent.			27 per cent.			28 per cent.			29 per cent.			30 per cent.		
26	..	..	..	30	56	− 4	30	56	− 4	..	..	..	29	55	− 3
27	31	58	− 4	30	57	− 3	30	57	− 3	30	57	− 3	29	56	− 2
27½	31	58½	− 3½	..	..	..	..	..	..	..	..	..	30	57½	− 2½
28	31	59	− 3	30	58	− 2	30	58	− 2	30	58	− 2			
29	32	61	− 3	30	59	− 1	30	59	− 1	30	59	− 1	29	58	0
29	32½	61½	− 3½												
29½	..	..	..	..	..	..	..	..	..	29½	59	0			
30	31	61	− 1	30	60	0	30	60	0	..	..	..	29	59	+ 1
30½	..	..	..	..	..	..	..	..	..	29	59½	+ 1½			
31	31	62	0	30	61	+ 1	29½	60½	+ 1½	29	60	+ 2	28½	59½	+ 2½
32	30	62	+ 2	30	62	+ 2	29	61	+ 3	29	61	+ 3	28	60	+ 4
32½	..	..	..	..	..	..	..	..	..	28½	61	+ 4	27	59½	+ 5½
33	30	63	+ 3	29½	62½	+ 3½	29	62	+ 4	28	61	+ 5	26	59	+ 7
33	..	..	..	..	..	..	..	..	..	27	60	+ 6	25	58	+ 8
33½	..	..	..	..	..	..	28	61½	+ 5½	26½	60	+ 7	24½	58	+ 9
34	30	64	+ 4	29	63	+ 5	27	61	+ 7	26	60	+ 8	24	58	+10
34	..	..	..	..	..	..	26	60	+ 8	25	59	+ 9			
34½	..	..	..	28	62½	+ 6½									
35	29	64	+ 6	27	62	+ 8	25	60	+10	24½	59½	+10½	23½	58½	+11½
36	28	64	+ 8	26	62	+10	25	61	+11	24	60	+12	23	59	+13
36	..	..	..	..	..	..	24	60	+12						
36½	27	63½	+ 9½												
37	26	63	+11	25	63	+12	24	61	+13	23	60	+14	22	59	+15
37	..	..	..	..	..	..	..	..	..	22	59	+15	21	58	+16
38	25	63	+13	24½	63	+13½	24	62	+14						
38	..	..	..	23	61	+15	23	61	+15						
38	..	..	..	..	..	..	22	60	+16						
39	25	64	+14	24	63	+15									
39½	24	63½	+15½												
	Mean	62·1	+ 4·0	..	60·9	+5·09	..	60·1	+6·11	..	59·6	+5·35	..	58·2	+5·94

TABLE IV. (continued).—Isogens, according to the Age Combination of Parents, showing at the same time the *total* and the *difference* of both ages.

Isogens of 31 to 35 per cent.

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	31 per cent.			32 per cent.			33 per cent.			34 per cent.			35 per cent.		
24	..	..	..	26	50	− 2	25½	49½	− 1½	25	49	− 1	24	48	0
24½	..	..	..	..	..	..	..	..	..	..	..	..	24½	49	0
25	27	52	− 2	26	51	− 1	25	50	0	25	50	0	25	50	0
26	28	54	− 2	26	52	0	26	52	0	25	51	+ 1	25	51	+ 1
26½	..	..	..	27	53½	− ½									
27	29	56	− 2	28	55	− 1	27	54	0	26	53	+ 1	25	52	+ 2
28	29	57	− 1	29	57	− 1	28	56	0	26½	54½	+ 1½	25	53	+ 3
29	29	58	0	28½	57½	+ ½	28	57	+ 1	27	56	+ 2	25½	54½	+ 3½
30	28½	58½	+ 1½	28	58	+ 2	27	57	+ 3	26	56	+ 4	25	55	+ 5
30	..	..	..	..	..	..	..	..	..	25	55	+ 5	24	54	+ 6
30½	..	..	..	..	..	..	26	56½	+ 4½						
31	28	59	+ 3	27	58	+ 4	25	56	+ 6	24	55	+ 7	23	54	+ 8
31	..	..	..	..	..	..	..	..	..	..	..	..	20	51	+11
31½	..	..	..	26	57½	+ 5½	..	..	..	.	..	..	22	53½	+ 9½
32	27	59	+ 5	25	57	+ 7	24	56	+ 8	23	55	+ 9	21	53	+11
32	26	58	+ 6												
32½	..	..	..	24	56½	+ 8½									
33	25	58	+ 8	23	56	+10	23	56	+10	22	55	+11			
33	24	57	+ 9	..	..	..	..	..	..	21	54	+12			
33	..	..	..	..	..	..	..	..	..	20	53	+13			
34	23½	57½	+10½	22½	56½	+11½	22	56	+12						
35	23	58	+12	22	57	+13	21	56	+14						
35½	..	..	..	21	56½	+14½									
36	22	58	+14												
36	21	57	+15												
	Mean	57·1	+5·13		55·6	+4·44		54·8	+4·38		53·6	+5·04		52·2	+4·6

Table IV. (continued).—Isogens, according to the Age Combination of Parents, showing at the same time the *total* and the *difference* of both ages.

Isogens of 36 to 45 per cent.

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	36 per cent.			37 per cent.			38 per cent.			39 per cent.			40 per cent.		
24	24	48	0	23	47	+ 1	23	47	+ 1	23	47	+ 1			
24½	..	..	..	..	..	..	..	..	..	..	..	..	23	47½	+ 1½
25	24	49	+ 1	24	49	+ 1	23	48	+ 2	23	48	+ 2	23	48	+ 2
26	24½	50½	+ 1½	24	50	+ 2	24	50	+ 2	23	49	+ 3	23	49	+ 3
27	25	52	+ 2	24	51	+ 3	24	51	+ 3	23	50	+ 4	23	50	+ 4
27½	..	..	..	..	..	..	..	..	..	..	..	..	22½	50	+ 5
28	25	53	+ 3	24	52	+ 4	24	52	+ 4	23	51	+ 5	22	50	+ 6
28½	..	..	..	..	..	..	..	..	..	22½	51	+ 6	21½	50	+ 7
29	25	54	+ 4	23½	52½	+ 5½	23	52	+ 6	22	51	+ 7	20	49	+ 9
29	..	..	..	23	52	+ 6	20	49	+ 9	21	50	+ 8	19	48	+10
29	..	..	..	..	..	..	19	48	+10	20	49	+ 9	18	47	+11
29	..	..	..	..	..	..	..	..	..	19	48	+10			
29½	24	53½	+ 5½												
30	23	53	+ 7	22	52	+ 8	22	52	+ 8						
30	20	50	+10	21	51	+ 9	21	51	+ 9						
30	..	..	..	20	50	+10									
30	..	..	..	19	49	+11									
31	22	53	+ 9												
31	21	52	+10												
	Mean	51·6	+4·82	..	50·5	+5·50	..	50·0	+5·40	..	49·4	+5·50	..	48·8	+5·85

Age of the father.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.	Age of the mother.	Total.	Difference.
	41 per cent.			42 per cent.			43 per cent.			44 per cent.			45 per cent.		
24	22	46	+ 2	22	46	+ 2	21	45	+ 3	..	..	..	20	44	+ 4
24½	..	..	..	..	..	..	..	..	..	21	45½	+ 3½			
25	23	48	+ 2	22	47	+ 3	22	47	+ 3	21	46	+ 4	20	45	+ 5
26	22	48	+ 4	22	48	+ 4	21	47	+ 5	21	47	+ 5	21	47	+ 5
27	22	49	+ 5	21	48	+ 6	21	48	+ 6	20	47	+ 7	19	46	+ 8
27	..	..	..	..	..	..	20	47	+ 7	19	46	+ 8	18	45	+ 9
27	..	..	..	..	..	..	19	46	+ 8	18	45	+ 9			
27½	..	..	..	20	47½	+ 7½									
28	21	49	+ 7	19½	47½	+ 8½	18	46	+10						
28	20	48	+ 8	18	46	+10									
28	19	47	+ 9												
	Mean	47·9	+5·29	..	47·1	+5·86	..	46·6	+6·00	..	46·1	+6·08	..	45·4	+6·20

From this table we learn that in order to secure a fertility, for instance, of 25 per cent.

if the father is 31, the mother ought to be 31 ; total 62.
,, ,, 32, ,, ,, 31 ; ,, 63.
,, ,, 33, ,, ,, 30½ ; ,, 63½.
,, ,, 34, ,, ,, 30 ; ,, 64.
,, ,, 35, ,, ,, 30 ; ,, 65.
,, ,, 36, ,, ,, 29 ; ,, 65.
,, ,, 37, ,, ,, 28 ; ,, 65.
,, ,, 38, ,, ,, 27½ ; ,, 65½.
,, ,, 39, ,, ,, 25 ; ,, 64.
,, ,, 40, ,, ,, 24 ; ,, 64.

We remark here a most striking inverse movement ; if the age of the father goes upwards, that of the mother declines. The movement is not quite equal, but the difference of its speed is not very great ; whilst the one age rises by nine years the other falls by seven. In consequence of this fact, the total of the two ages ought to be nearly constant, and we see really that it varies between 62 and 65½ only.

Now, this inverse movement of the complementary age repeats itself at all isogens. We remark only the modification that the sum of the ages becomes constantly greater the higher we advance on the ladder of natality. This is but a natural consequence of the fact that the higher ages are accompanied by a weaker procreative force.

The following figures show the connexion between the degree of natality and the change of the complementary age, as well as the average sum of the ages of both parents taken together :—

Degree of natality in per cents.	Includes the following ages :—		Average of the summed ages of the two parents.
	of the father.	of the mother.	
1	48–56	47–45	97·8
2	42–56	45–44	93·7
3	40–57	45–43	92·2
4	40–57	44–40	91·4
5	40–55	43–39½	89·3
6	39–55	43–38	88·2
7	39–53	42–38	86·8
8	39–53	42–38	86·3
9	36–52	42–38	84·5
10	36–52	41–38	83·7
11	36–52	40–37	82·8
12	35–49	40–33	80·8
13	34–49	40–32	79·4
14	34–48	39–32	78·2
15	33–47½	39–30	77·0
16	33–45½	38–29	75·7
17	31–44	38–29	73·7

Degree of natality in per cents.	Includes the following ages:—		Average of the summed ages of the two parents.
	of the father.	of the mother.	
18	32–43	37–31	72·8
19	30–43	36–29	71
20	30–43	34½–27	69·3
21	30–41	35–28	68·7
22	30–40	34–26	67·4
23	30–40	34–26	66·1
24	29–39	34–26	64·6
25	27–40	34–24	63·3
26	27–39½	32½–24	62·1
27	26–39	30–23	60·9
28	26–38	30–22	60·1
29	27–37	30–22	59·6
30	26–37	30–21	58·2
31	25–36	29–21	57·1
32	24–35½	26–21	55·6
33	24–35	25½–21	54·8
34	24–33	27–20	53·6
35	24–32	25½–20	52·2
36	24–31	25–20	51·6
37	24–30	24–19	50·5
38	24–30	24–19	50·0
39	24–29	23–19	49·4
40	24½–29	23–18	48·8
41	24–28	23–19	47·9
42	24–28	22–18	47·1
43	24–28	22–18	46·6
44	24½–27	21–18	46·1
45	24–27	21–18	45·4

We see that the total ages of father and mother vary within the following limits:—

at the isogen of 1 per cent. it amounts to . . . . . . 97·8 years
„ „ 45 „ „ „ . . . . . . 45·4 „

the difference within the 45 degrees of natality thus makes 52 years, that is on the average about one year for each degree. If the course of the isogens were a quite regular one, we ought to find that in proportion as we advance by one unit (1 per cent.) in the ladder of natality, the total of the ages falls by one unit (1 year). This explains the foundation of Mr. Galton's striking formula.

This formula thus furnishes the means of rapid orientation in the midst of the confusing mass of figures contained in the bigenous table of natality. Its applicability depends naturally on the way in which the age difference of 52 years is distributed over the 45 isogens. As the calculation is made on the basis of adjusted figures, and as the aim of adjustment is just the smoothing of irregular dispersions, the distribution found is a more regular one. This may be seen by the following figures, which represent the totals of the parental ages, and the degrees of natality (see Table IV.).

Degree of natality in per cents.	Total of the age of father and mother and probability of birth.*	Degree of natality in per cents.	Total of the age of father and mother and probability of birth.*	Degree of natality in per cents.	Total of the age of father and mother and probability of birth.*
45	90·4	30	88·2	15	92
44	90·1	29	88·6	14	92·2
43	89·6	28	88·1	13	92·4
42	89·1	27	87·9	12	92·8
41	88·9	26	88·1	11	93·8
40	88·8	25	88·3	10	93·7
39	88·4	24	88·6	9	93·5
38	88	23	89·1	8	94·3
37	87·5	22	89·4	7	93·8
36	87·6	21	89·7	6	94·2
35	87·2	20	89·3	5	94·3
34	87·6	19	90	4	95·4
33	87·8	18	90·8	3	95·2
32	87·6	17	90·7	2	95·7
31	88·1	16	91·7	1	98·8

The regularity of the results is, indeed, surprising, especially if we exclude the highest ages with the lowest natality of 5 or less per cent. We find that this total fluctuates only within the limits of 87 and 94 years. We see, further, that the formula of Mr. GALTON may be applied even to a greater bulk of the families than he himself designed: it holds good for all those couples where the mother being not above 40 years, the father is not younger than the mother, and we need not exclude those where the mother is below 23–40 years.†

13. *Returning Isogen Points.*

The curves of natality moving up and down, we must find returning isogens. Imagining the whole body of the bigenous natality as a hypsometrical map, there must be found on both slopes different points which are at the same level. Amongst these points those merit a special interest which correspond to a considerably different age of the other partner. Thus, for instance, it seems worthy of attention, when we learn that mothers of 24 years show the same natality (that is of about 35 per cent.) with husbands of 24 as with husbands of 30 years: the inlying period of five years shows natalities of 36, 37, and even 38 per cent., whilst at the 30th year the natality sinks to 35 per cent., and sinks still further in the case of the further advanced ages of the husbands.

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* That is $m + p + n$ (see p. 847). Example: for the probability of 45 per cent. (p), the ages of father (p) and mother (m) make 45·4 years (see p. 854), and thus the total of the 3 figures = 90·4.

† Mr. GALTON is quite right to select only those most general cases, where the father is older than the mother, otherwise we ought to suppose that a father of 20 and a mother of 50 have the same natality as a mother of 20 and a father of 50. For such wide age-distances our table does not furnish sufficient material, the greatest available age-distance being 17½ years, and in general, out of the 612 positions of Table IV., there are only 134 where the mother is older. But even amongst these there is only one combination where the mother is 7 years older, only 6 where she is 6, and 15 where she is 5 years older. In consequence of the scarcity of these cases, we could extend our calculation over all age combinations, including even those where the mother is older. Referring to the quoted facts, we may thus venture to say that the Galton formula holds good not only for the cases of older husbands, but also for those families where the husband is about 5 years younger than his wife.

If we pay attention only to the most prominent returns, that is those where the return occurs after at least 5 years, we find on the adjusted table the following points of parity :—

Mothers of	23	with fathers of	23	and	30	years	(36·3 and 36·5 per cent.)
„	24	„ „	24	„	30	„	(35·3 per cent.)
„	25	„ „	25	„	31	„	(33·5 and 33·1 per cent.)
„	26	„ „	24	„	32	„	(31·4 „ 31·5 „)
		„ „	26	„	31	„	(32·2 „ 32·6 „)
„	27	„ „	25	„	32	„	(30·6 „ 31·1 „)
		„ „	26	„	32	„	(31·2 „ 31·1 „)
„	28	„ „	25	„	32	„	(30·3 „ 31·2 „)
		„ „	26	„	31	„	(30·7 „ 30·8 „)
„	31	„ „	26	„	31	„	(25·5 „ 24·9 „)

14. *Isogens and Age Distances.*

The isogens in Table III. are constructed on the basis of the age combinations. But we may remember that the maximal points of natality followed a most remarkable regularity, when we referred, instead of the age combination, to the age distance of the parents. This circumstance ought to encourage us in enquiring if any regularity could be found for the relation between age distance and the isogens.

The Table No. III. is not suited for such enquiry. To use it with the intention here mentioned, we have to transform it by investigating, step by step, how, with the advancing age of mother or father, the age distance ought to change in order to obtain always the same natality. In Table IV. this calculation is made, following the change of the paternal age. In order to complete these data by a corresponding table for the mothers, I add Table V.

This latter table shows a more simple form than the first-mentioned, though the aim of both is the same. Table IV. contains for each isogen 4 data : (*a*) the paternal age ; (*b*) the complementary maternal age ; (*c*) the (positive or negative) difference ; and (*d*) the sum of the two ages. Now, as this sum is in Table IV. necessarily the same as in Table V., it may here be omitted. Further, for simplicity's sake, I preferred to insert here the age-difference only (*c*), without mentioning the complementary age (being simply $a + c$).

Further, since the difference of the paternal age is always a positive one (that is, since, in order to maintain the same isogen, the father ought to be always older than the mother), we may use instead of "age-difference" the more specific term of "age-advantage."

TABLE V.—Complementary Age-Advantage of the Father. The figures show how many years the father ought to be older in order to maintain the natality indicated in the heading. (The figures in brackets refer to crossing points of natality.)

Age of the mother.	1 per cent.	2 per cent.	3 per cent.	4 per cent.	5 per cent.	6 per cent.	7 per cent.	8 per cent.	9 per cent.	10 per cent.	11 per cent.	12 per cent.	13 per cent.	14 per cent.	15 per cent.
30	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17½
31	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16
31½	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14½
32	..	..	..	..	..	..	..	..	..	..	..	..	17	16	13
33	..	..	..	..	..	..	..	..	..	..	..	16	15½	13	11
34	..	..	..	..	..	..	..	..	..	..	..	15	12½	10	10
35	..	..	..	..	..	..	..	..	..	..	..	..	10	9	8
35½	..	..	..	..	..	..	..	..	..	..	..	12½	..		
36	..	..	..	..	..	..	..	..	..	..	..	11	8½	8	7
37	..	..	..	..	..	..	..	..	..	..	13	9	7	6	6
37½	..	..	..	..	..	..	..	..	..	..	9½				
38	..	..	..	..	..	17	15	14½	13½	12	8	7	6	5	3
38½	..	..	..	..	..	..	..	..	11½	8½	..	5½	4½	3½	¾
39	..	..	..	..	..	15	12½	11	9	7	6	4½	2	−1½	−3½
39½	..	..	..	..	15½	..	..	9	..	..	..	3½	−½		
40	..	..	..	16½	14	11½	9½	7	6	4½	0	−1½	−4		
40½	..	..	..	..	..	8½	..	5½							
41	..	..	..	15	10½	7	6	3	1	−1½					
41½	..	..	..	..	7½	5½	3½								
42	..	..	..	10½	5	2½	−½	−1½	−5						
42½															
43	..	..	11	4½	−½	−2½									
43½	..	..	6½	½											
44	..	10½	1¾	−2½											
44½	..	7½													
45	10	1½	−4½												
45½	7½														
46	5														
47	1½														

TABLE V. (continued).—Complementary Age-Advantage of the Father.

Age of the mother.	16 per cent.	17 per cent.	18 per cent.	19 per cent.	20 per cent.	21 per cent.	22 per cent.	23 per cent.	24 per cent.	25 per cent.	26 per cent.	27 per cent.	28 per cent.	29 per cent.	30 per cent
21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16
22	..	..	..	..	..	..	..	..	..	..	..	..	16	15	15
23	..	..	..	..	..	..	..	..	..	..	..	15	15	14	13
23½	..	..	..	..	..	..	..	..	..	..	..	..	..	..	11½
24	..	..	..	..	..	..	..	..	..	16	15½	15	13	12	10
24½	..	..	..	..	..	..	..	..	..	..	..	13½	..	10½	9
25	..	..	..	..	..	..	..	..	..	14	13½	12	10½	9	8
26	..	..	..	..	..	..	14	14	13	12	11	10	8	8	7
26½	..	..	..	..	..	..	..	..	..	..	..	..	..	7	
27	..	..	..	..	16	..	13	12	11	11	9½	8	7	6	5½
28	..	..	..	..	15	13	11½	11	10	9	8	6½	5½	5	4
28½	..	..	..	..	..	..	..	..	..	..	..	..	..	4	2½
29	16½	15	..	14	13	11½	10	9	8	7	6	5	3½	2¼	½(−2½)
29½	..	..	..	..	..	..	..	..	..	..	..	3½	1½	0	
30	15	14	..	12½	12	10	9	7½	6	4½	3	−1	−2	−2	(−2½)
30½	..	..	..	..	..	..	..	..	..	2½					
31	13	12	12	11	10	8½	7½	6	3	½	−½(−3½)				
31½	..	..	..	..	..	..	..	4½	½						
32	11½	11	10	9	8	7	6	1½	−1	−1½(−5)	−(−3)				
32½	..	..	..	..	7½	..	..	..	..	..	−3½				
33	10	9	8	7	6(0)	5	1½	−2	−3	−3 (−5)					
33½	..	..	..	..	..	..	−2½								
34	9	8	6½	5	4	0	−4	−4	−4½	−5¼					
34½	8	.	..	..	2½										
35	7	6	4½	2½	..	−5									
35½															
36	6	3½	1	−3											
37	5	−½	−3½												
38	−1	−5													

Age of the mother.	31 per cent.	32 per cent.	33 per cent.	34 per cent.	35 per cent.	36 per cent.	37 per cent.	38 per cent.	39 per cent.	40 per cent.	41 per cent.	42 per cent.	43 per cent.	44 per cent.	45 per cent.
18	..	..	..	..	..	..	..	..	..	11	..	10	10	9	9
19	..	..	..	..	..	..	11	10	10	10	9	..	8	8	8
19½	..	..	..	..	..	..	..	..	..	..	..	8½		..	..
20	..	..	..	13	11	10	10	9	9	9	8	7½	7	7	(4½)
21	15	14½	14	12	11	10	9	9	8	..	7	6	5½(3)	4¼	5
21½	..	..	..	..	..	..	..	..	..	7					
22	14	13	12	11	9½	9	8	8	7	6	4½(2)	3	3		
22½	..	11½	..	..	..	..	..	..	6	5					
23	12	10	10	9	8	7	6(1)	6(1½)	3	2½	2				
23½	10½	..	..	..	..	..	5½								
24	9	8½	8	7	6(0)	5½(½)	2½	3							
24½	..	..	..	..	(0)	1½									
25	8	7	6(0)	5(0)	5(1½)	3									
25½	..	..	(−1½)	..	(3½)										
26	6	5½(−1)	4½(0)	4(1)											
26½	..	..	..	(1½)											
27	5(−2)	4(−½)	3(0)	2											
28	3(−2)	2(−1)	1(0)												
28½	1½	½													
29	0(−1½)	−1													

The figures of this table differ in a slight degree from those contained in No. IV, in consequence of the fact that for all those cases where a given maternal age is combined with different paternal ages, we are obliged to take the latter in one average figure.*

We deduce from the examination of these complementary age advances:

1. That the complementary age advance of the husband is the greatest if the wife is young, becomes always smaller with the advancing age of the wife, and turns finally to the *minus* side (denoted in the Table V. by a heavy line) with the oldest wives; that is to say that, with these latter, the isogen natality is secured only if the father is younger than the mother. This can be at once perceived by the following extract of Table V.

PATERNAL Age Advance required in order to maintain the following Degrees of Fertility† :—

	25 per cent.	30 per cent.	35 per cent.	40 per cent.
If the mother has 20 years	..	..	11 years	9 years
" " 21 "	..	16 years	11 "	7 "
" " 22 "	..	15 "	9½ "	6 "
" " 23 "	..	13 "	8 "	2½ "
" " 24 "	16 years	10 "	6 "	..
" " 25 "	14 "	8 "	5 "	..

2. With the advancing age of the husbands the effect is naturally the reverse: the older the husband the younger is the wife required to be in order to secure the same level of fertility (see Table IV.).

3. If for any age of the mother we advance from the lower degree of natality to the higher ones, the paternal age advance becomes always smaller (as may be seen by reading the figures in Table V., as they follow along the same line). This is caused by the fact that with young people, where the age distance is but small, the fertility is the greatest. If we advance according to the paternal age, we arrive at reciprocal values.

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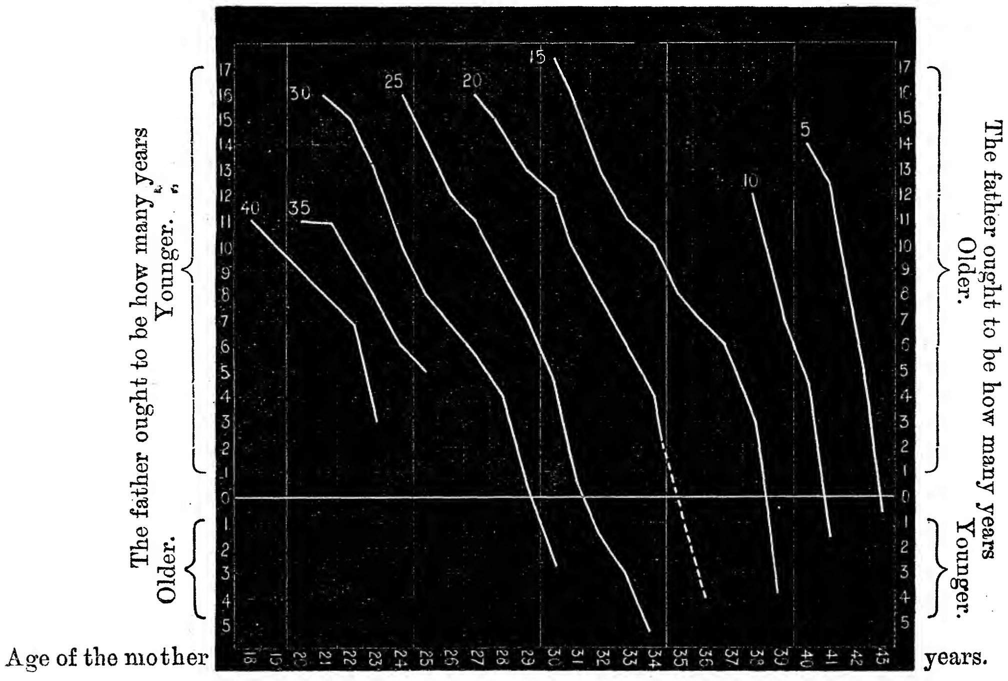
* Example: In Table IV. (p. 849) we find that the natality of, for instance, 15 per cent. is obtained for the fathers of 40, 41, and 42 years with mothers of 38. Starting now from the maternal age, we accepted the corresponding paternal age with the average of 41, and thus the age-difference with 3 years (see Table V., p. 859, last column). This circumstance causes in such cases the age-difference of Table V. to differ in a slight degree from that in Table IV.

† The values belonging to returning sections of the curve are put in Table V. into brackets and have not been taken above into calculation, as it would lead to erroneous averages if we reckoned mean values for returning isogen points which stand at the same distance from each other. If, for instance, mothers of 24 years show the same natality if the father is 24 and if he is 30 years old, we did not calculate a mean age-difference of 3 years, but we pointed out separately first the difference of 0 years, and then, within the brackets, the age difference of the returning isogen (6 years).

15. *Crossing Points of the Isogens.*

If we transform the age distances of Table V. into a diagram where the height of the ordinate corresponds to the unities of the paternal age advance, this facilitates the survey of some qualities of the isogens. In the following diagram we restrict ourselves to only eight isogens. (*Example:* To secure a natality of 40 per cent., a wife of 18 years ought to choose a husband who is 11 years older, at 19 years who is 10 years, at 23 years who is 3 years older. The natality of 25 per cent. is secured for a wife of 24 years with a husband who is 16 years older, for a wife of 31 years with a husband of the same age, for a wife of 34 years with a husband who is 5 years *younger*, &c.)

Connexion between Isogens and Age Difference, for the Isogens of 5, 10, 15, 20, 25, 30, 35, and 40 per cent.



The regularity of these curves is a most striking one, and proves that the age distance of the consorts has a most positive influence on fertility.

This diagram enables us also to see in a most distinct way, how the crossing point, viz., that maternal age at which the positive age distance of the father crosses the 0° (that is, turns to naught or to *minus* value), changes with the degree of natality which is intended to be maintained. This crossing point arrives :—

For the isogen of 5 per cent. at 43 years
,, ,, 10 ,, ,, 41 ,,
,, ,, 15 ,, ,, 38½ ,,
,, ,, 20 ,, ,, 35 ,,
,, ,, 25 ,, ,, 31 ,,
,, ,, 30 ,, ,, 29 ,,

If we turn the question by following the single degrees not of the natality, but of the mother's age, we find that this crossing point does not arrive before the 24th year of the mother, and changes then as follows :—

24 years at the natality of 35 per cent.
25 ,, ,, ,, 34 and 33 per cent.
26 ,, ,, ,, 32 per cent.
27 ,, ,, ,, 32 ,,
28 ,, ,, ,, 31 ,,
29 ,, ,, ,, 30, 29 and 28 per cent.
30 ,, ,, ,, 27 per cent.
31 ,, ,, ,, 26 and 25 per cent.
32 ,, ,, ,, 23 per cent.
33 ,, ,, ,, 22 ,,
34 ,, ,, ,, 21 ,,
36 ,, ,, ,, 19 and 18 per cent.
37 ,, ,, ,, 17 per cent.
38 ,, ,, ,, 16 ,,
39 ,, ,, ,, 14 ,,
40 ,, ,, ,, 12 and 11 per cent.
41 ,, ,, ,, 10 and 9 ,,
42 ,, ,, ,, 8 and 7 ,,
43 ,, ,, ,, 5 per cent.
44 ,, ,, ,, 3 ,,
45 ,, ,, ,, 2 ,,

(The maternal ages can be found in Table IV.)

V.—Further Uses and Remarks.

The probabilities of death were soon utilised for practical purposes, that is for the establishment of life-insurance. It is not impossible that the probabilities of birth may also lead to a new species of insurance, in order to cover the costs of child-bed or even the education of the child. In this latter case, as the chances which exist against the birth of a child are in favour of the insurer, the premiums could be lower than those for a child already existing. If the probabilities of birth should once be used also as nett premium tables, as was the case with the probabilities of death, in order to make such an institution possible, one ought to provide against this insurance becoming a premium on procreation. The insured sum ought to be therefore in proportion to the revenue of the family, and the question might arise whether it would not be advisable not to begin the insurance before the second or third child?

But it is not this practical use of the Table of Natality which I intend to treat of, but only some theoretical points, especially with regard to the questions how far, and in what direction, tables of natality, like those of mortality, could be utilised to deduce other statistical values. But before entering upon this subject, we submit to the reader's attention some distinctions and definitions.

Speaking of the "fertility" or "fecundity" of a population, it is not clear what signification we give to this word, and thus it is most necessary to fix the distinctions and to create well-defined terms.

We may mean by the word fertility the proportion of the *annual* number of births to the whole population, or to that part of it which stands in the procreative period, or to the married couples, and in the latter case to all couples together, or only to those at the procreative age, or finally only to the couples of a certain given age. To add to the trouble, there exists no agreement either about the limits between which the age of fertility extends, or about the point whether all births should be taken into account, or only the born-alive, and likewise whether the multiple births should count for one or for as many as the number of children.

In all these questions the number of births is limited to a single year. But besides this, we may investigate the whole number of children produced during the average duration of marriages or other space of time (5, 10, 15, etc., years), or the whole number of children which can be produced by a couple living together through the whole period of procreation.

Let us call the first group of measures those of the *fecundity* or *fertility* of a population, the second those of *richness of families*.*

Further, to clear up two of the difficulties before mentioned, let us agree that the number of births shall include only the born-alive, excluding the still-born, as these represent only 3 per cent. of births, and as thus the transition from the movement of population to the state of it becomes easier, the census of a population taking account of the new-born but not of the still-born. This latter reason speaks also in favour of counting not the births but the number of children born; the difference is finally but trifling.

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* In French, we could use the terms "fécondité" and "rendement des mariages;" in German, "Fruchtbarkeit" and "Ergiebigkeit der Ehen."

Measures of Fecundity.

1. The measure most used is the proportion between the children born in a year and the number of the population. This is the *general birth-rate,* corresponding to the general death-rate in the statistics of deaths. Thus, if we say that from 1886 to 1890, the fecundity was in Hungary 43·8 per cent., in Austria 37·7 per cent., in Italy 37·6 per cent., in Germany 36·5 per cent., in the United Kingdom 30·3 per cent., in Sweden 28·8 per cent., in France 23·1 per cent., we compare the general birth-rates. Adopting the abbreviations used by FOURIER, BERNOULLI, BERTILLON, and others, we may express these values by the formula N/P (N = number of births, P = population). By distinguishing the legitimate births from the illegitimate, we obtain the general legitimate, or the general illegitimate birth-rate, designed by lN/P and iN/P.*

2. As the number of children depends on the quantity of people at the productive ages, it has been recommended by BERG to restrict the comparison of the number of births to that of women at the procreative age. This proportion has been named by BERTILLON *the special birth-rate.* But there is no objection why we should not proportionate the births also to the fathers of productive age. Denoting the male population by P', the female by P'', and the productive age by p, we might call the first measure N/P_p'', the female, the second, N/P'_p, the male special fecundity.†

3. In order to find the measure of the *legitimate* fecundity, one compares generally the number of marriages concluded in a year, with the number of children born in the same year. But it is obvious that these births are produced but in a very small proportion by these couples, and that consequently this measure is an erroneous one. The simple diminution of marriages (that is, of the divisor) is sufficient to make the measure of fecundity rise, which, therefore, could be used only in an imaginary and nowhere existing state of a quite invariable population. It is a strong proof of the neglected state of natal statistics, that though the insufficiency of this proportion was pointed out by MALTHUS so long as a century ago, statistics still use it as a measure of fecundity, no better measure being at their disposition.

4. A much more correct and also much used method consists in proportionating the number of births to the number of all the married wives (W), or only to those who stand in the productive age. But here, too, one might equally proportionate them to the husbands (H). Let us name the first ratio N/W (or N/W_p) the general (or special) female, and the other, N/H (or N/H_p) the general (or special) male legitimate fecundity. This measure coincides with the two final average

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* BERTILLON uses for some cases special types of letters. Thus the Roman N signifies the illegitimate births, the antique **N** the legitimate births, the Albion **P** the widow population, etc. As this kind of notation offers difficulties both in spelling and in writing, I thought better to change it.

† It is obvious that all the measures which refer to the "productive age" are not exact, since they change with the arbitrary limits of this age. So we arrive at quite different measures if we accept, *e.g.*, as "productive age" of mothers, the period from 16 to 40, or from 14 to 50, or even 55 years, &c.

natalities of our two monogenous tables of natality. But this measure also is not sensible enough, as it represents only a rough average, uniting in one single figure all those most different degrees of fecundity belonging to the different ages. For the last two centuries, when measuring the frequency of deaths, we have not contented ourselves with the rough average of all ages, as represented by the general death-rate: we know, since the time of HALLEY, that the frequency of deaths must be stated age by age. But it is quite the same with the measurement of the force of natality, and it is just this task which the present paper tries to resolve.

The same measure can be obtained for the illegitimate fecundity, putting as numerator the number of illegitimate births, and as denominator that of unmarried people (U' or U''). Thus the special illegitimate fecundity for the female sex is iN/U''_p. But let us here remark that it would be erroneous to think that the addition of the legitimate and the illegitimate natality would furnish the measure of the whole fecundity existing in the midst of a population. Fecundity is the effect of a physiological process. The measure of its force can consequently be recognized for that part of the population only which is exposed to this cause, that is for married people. For these the event of a birth is the effect of a natural law, whilst, on the contrary, each illegitimate birth represents but an exception, an offence against social laws. Thus the total of legitimate and illegitimate natality offers only the statistical expression of the state of things, but not the measure of the force of procreative power.

5. Especially with the legitimate fecundity, we have to provide for the fact that the number of children depends not only on the number of husbands or wives at the procreative age, but also on the condition that *both* partners of the couple be still prolific. The birth-rates mentioned before are all monogenous ones; it needs no proof that the bigenous birth-rates furnish a more reliable measure of legitimate fecundity. To obtain this measure we have to put into the denominator the couples (C) at productive age. The fecundity of productive couples, applicable only to legitimately united ones, is thus measured by lN/C_p.

6. But the mass C_p (couples at "productive age") changes with the arbitrary choice of its age-limits and is therefore not exactly defined. We find finally that the only right measure of fecundity is obtained by investigating not the fecundity of the whole productive population, but for a single age element of it. We arrive then at those statistical values which we have treated in the present paper, and which we named Natalities, attributing to this term the same quality of probability as in the life-table to the term Mortality. When these probabilities referred to single years of age, we called them Specified, if to groups of age, Cumulative. We had further to distinguish the Monogenous natalities from the Bigenous ones. If we denote the given age by x, the monogenous legitimate natality is measured for the husbands by N_x/H_x, for the wives by N_x/W_x and the bigenous by N_x/C_x.

Measures of the Richness of Marriages (Expectation of Children).

The most used measure is, to compare the number of married couples with that of children, both figures being taken from the census. But this value is nearly without use, and that from the following causes: it embraces only the children then alive, without taking into account those that died; it omits those who at the census day were not present in the family; it does not consider two fundamental causes of fertility, viz., the age of the parents and the duration of marriage.

The question how to obtain a right measure of the richness of marriages being a wide one and not depending directly from the Table of Natality, I cannot allow myself to enter into details.* I touch this question only with regard to the parallelism which exists between the Tables of Natality and those of Mortality. Just as these latter furnish still another most important value, the expectation of life, that is, the number of years which we have to expect at a given age, we might similarly put the question: What is the number of children which a married person has to expect for a certain period of time? that is, How are we to obtain a statistical value for "the expectation of children"?

But there is to be found an essential difference between these two expectations. The event of death arrives only once in life, and is only a thing of the future, whilst the event of birth exists also in the past. Thus we have to distinguish two different probabilities—

a. For the whole of future life (future fertility);

b. For the whole of past life (past fertility); and as total of both values—

c. Life fertility, that is, number of children during the whole duration of life, and as a special kind of this latter, the *full* life fertility, showing the number of children to be expected for the case that the parents lived together during the whole procreative period.

But these values cannot be deduced from the Table of Natality, which shows only the probability of birth for a year. One might perhaps think that the addition of the natalities stated for each year of the procreative period, would furnish the probability for this whole period. To prove the impracticability of such a proposition it is sufficient to point out the physiological fact that female conception stops not only during childbed, but even during the period of lactation. There exists between two births a natural interval, which, moreover, is further increased by the moral moment. Consequently it cannot be expected that the probability of birth for the wives who become mothers in this year, will in the *following year* be the same as for the averages of wives *one year older*. In this latter average the above-quoted wife-mothers of the preceding year form but a small minority, the majority being represented by women who have paused in child bearing for some time. In general, since the probabilities of birth are not the same for the subsequent years of age, it would be erroneous to group them together. The idea that a wife passing during five years from the age of 30 to that of 35 could undergo *individually* the birth probabilities obtained for the total of the wives at the age of 30, 31, 32, 33, and 34 years is wrong: to observe for one year the natality of five mothers, each of them being one year older than the other, and to observe the natality of *one* mother for five subsequent years—these are two different things.

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* The author deals with this question in a more particular way in his 'Demologische Beiträge,' and in his book on the fertility in Budapest, now in preparation. Though this question cannot be treated in this place, I feel, notwithstanding, obliged to mention at least some important contributions to it. Such are—RUBIN-WESTERGAARD, 'Statistik der Ehen' (translated from the Danish), Jena, 1890; R. BOECKH's Essay in the fifth volume of the 'Bulletin of the International Statistical Institute'; ANSELL, 'Statistics of Families,' London, 1874; V. GOEHLERT, "Untersuchungen über die Ehen," in the 'Proceedings of the Vienna Academy,' 1869; GEISSLER, "On the Distance of Births," in the 'Zeitschrift des Sächs. Statistischen Bureaus'; and the important work of M. DUNCAN, 'On Fertility,' Edinburgh, 1866, frequently quoted in this essay.

I have to add only a few words more referring to the further development of the investigations on the Budapest birth probabilities.

The present Table of Natality is based on the total of the population as a whole. But as fertility is influenced in a prominent degree also by social moments, I am repeating the same observations for the cumulated ages of groups—for each of about twenty professions and bodies; and also for the three principal religious confessions of our population, that is, for Catholics, Protestants (Lutherans and Calvinists together), and Jews. This latter part of the work promises interesting results.

Finally, I may mention that the Municipal Council of Budapest has covered the costs of completing the Table of legitimate natality by investigations on the illegitimate natality.

APPENDIX.

Remarks relating to the Adjustment of the Rough Results.

The data furnished on the age of a large population are—besides the errors attaching to all observations of masses—still affected by two other sources of error, namely, that some people do not know their precise age, others do not confess it. Therefore one is in the right in adjusting the rough figures obtained, that is, in making disappear the improbabilities and contradictions produced by the inevitable incorrectness of the material. It being according to all physiological knowledge inadmissible to suppose that the generative power, after having begun to decline, should rise anew, if we meet such impossibilities in our curves, we are obliged to attribute them to errors in observation, and are thus entitled to smooth this protuberant part of the curve.

The adjustment may be applied either to the series of probabilities (percental numbers) or to the two series of the absolute numbers (that of the couples and of the children which they produced), the proportioning of which led to the figures of probability. I tried first to adjust the two series of absolute curves.

This adjustment has to take into consideration the condition that the total number of the smoothed section of the curve could not be changed, as this total was given and fixed. Thus, in adjusting the unevenness of the whole curve or a part of it, the mass which had been carried off in order to remove an impossible protuberance ought to be used to fill up a depression of the same curve. In these calculations I used the method of PEROZZO. This starts from the supposition that the regular curve which is to be re-established by the elimination of the adhering errors is no higher than of the second degree, so that the equations to be established are also only of this degree. The method used by WESTERGAARD is a more precise one, in so far as it allows also curves of a higher degree. But even the first-mentioned method formed so tiresome a work—filling, for the bigenous curves, whole sheets of calculations—that I could not wish to aggravate it by the introduction of equations of even the tenth degree.

But, finally, I had to let drop the whole attempt, finding that the probabilities, which had been calculated on the basis of the two corrected factors, formed still an irregular curve, which required to be again smoothed. As thus the smoothing of the values of probability could not be avoided, it seemed to me simpler to begin with this immediately, the more so as the smoothing of proportional figures does not require the above-mentioned aggravating condition.

Thus both the monogenous and the bigenous curves have been adjusted by smoothing the curves of the probabilities. But the bigenous curves show a particularity which throws quite new impediments into the way of adjusting. This difficulty is caused by the circumstance that the two series of curves (representing on one hand the female and on the other the male fertility) are not independent of one another, but that—like warp and woof—each element of the one is knitted to, or, rather, is identical with, one element of the other. Thus the aim is no longer the adjustment of two curved lines but that of a curved plane.

The bigenous table represents thus an enlacement of curves belonging to two different systems, according as we form the curves by connecting the single elements of it, as they stand one under the other in the *columns*, or one beside the other in the *lines* of the table. According to the construction of our table, the connection in the vertical axis (columns) gives the curves for the mother, changing with the advancing age of the fathers, whilst that of the horizontal axis (lines) furnishes the paternal curves, changing with the advancing age of the mothers. Thus each single figure of the bigenous table belongs at the same time to two different systems of curves, has therefore simultaneously to subordinate itself to two different laws of curves. If now the two laws are different, the difficulty is, how to satisfy both dissimilar or even opposite requirements.

Unfortunately, such contradictory positions present themselves in the bigenous curves rather frequently. Now, if we proceeded to smooth in one, let us say in the vertical direction, it might easily happen that we altered by this one or more figures which were quite right according to the law of the horizontal curve, but which would form, after the adjustment, an unevenness in that curve. To make it disappear, we begin to smooth in the horizontal axis, but may thus produce new irregularities in other parts of the vertical curves, and so on without end. Finally, after having smoothed repeatedly larger and larger sections as well of the longitudinal as of the latitudinal curves, we may readily arrive at a regular shape of the whole, at something like a globe. But one will perhaps argue, that in such a way we shaped the facts according to our preconceived opinion, and that in such a state of things, the question might be asked: Why struggle at all with the observation of facts, if we can arrive much more easily at the desired regularity by simply constructing it according to our preconceived ideas?

There is no doubt that the frequency of the oscillations of the curves depends on the largeness of the material, that is, on the number of age-combinations according to which it has been divided into parts. The larger the population observed, or the fewer the number of age-combinations established, the more regular the course of the curves. This is proved by the fact that the quinquennial recapitulation, based on only 54 age-combinations, shows in both axes a nearly absolutely regular course of its 17 curves. It may thus be supposed that the 59 curves of the yearly age-combinations would also offer a regular march if the population observed embraced 1½–2 millions of souls. But as I could observe only half-a-milllion, the frequent oscillations must be accepted as an inevitable consequence of the quantitative insufficiency of the material. Therefore, it seems to me not advisable to force on so small a material the regular course of all the 59 curves. I for my part should content myself with the adjustment of the two monogenous and the 17 quinquennial bigenous curves only.

Notwithstanding this, the reader will find below an attempt at adjusting all the bigenous curves, worked out by Dr. E. BLASCHKE, *Docent* at the Vienna University. This mathematician, who occupies himself especially with the question of curve smoothing, after having undertaken the adjustment of the two monogenous curves, felt disposed, by the very difficulties which the adjustment of the bigenous table presents, to try a solution of this task. The plan he followed, and the result of his work, will be seen by his two letters, and by the tables which I subjoin.

I. *On the Correction of the Monogenous Natalities.*

Vienna, November 29, 1893.

The adjustment of the monogenous tables of natality was conducted exclusively according to the remarks given by Mr. KŐRÖSI, pp. 11–14 of his "Beiträge zur Erweiterung der Natalitäts und Fruchtbarkeits-Statistik" (Berlin, 1893), and the study of the rough figures of his Table of Natality, but without taking into consideration any other preceding experience on the same subject.

The monogenous tables, though they were not deduced from a sufficiently large material, show characteristic forms even in the rough figures. Not only do the series of natalities constructed according to the age of the parents show only such discontinuities as are explicable without force by simple supposition of errors in observation, but they offer also throughout those characteristic features which—after the hints of Mr. KŐRÖSI's paper—would be expected *à priori*. The monogenous table of the fathers begins with 20 years with a maximum, and—after a dip at 22 years—returns to the climax of fertility at 25–26 years; further on, the natality declines somewhat equally towards the null-point at the limit of the procreative period. The female monogenous table shows, with a rapid rise, its maximum between 19 and 21 years, and falls then slowly but constantly to the period of sterility.

The two maxima of the male table can be simply explained by the two causes of fertility, the age of the parents and the duration of marriage. The second maximum may probably be attributed to the climax of male procreative power, the first maximum to the duration of marriage; the 20 year-old husbands having been all married but one or two years only, and these recent marriages being nearly all fertile ones, we meet at this place of the table a maximal value which could not be explained only by the age and by the generative power depending on it.

The female table shows only one maximum, in accordance with the fact that the age of marriage nearly coincides with that of greatest generative power.

The influence of these two factors (age of parents and duration of marriage) on the frequency of births cannot be other than a continuous one, and this for the following reasons:—

(*a*) One could not suppose *à priori* that the changes produced by one of the causes, taken by itself, could produce a discontinuity in the frequency of births, since all phenomena of human masses hitherto observed change continuously with their causes.

(*b*) But if none of the causes taken separately produces a discontinuous effect on a table depending exclusively on this one factor, it is evident that a table based on the effect of both factors and arranged according to the progress of age, will also show no point of discontinuity. With the age of the husband or of the wife, there is given simultaneously also an average duration of marriage for the families observed, an average which cannot change but in a continuous manner with the growth or diminution of age.

Therefore, as neither the examination of the rough figures, nor that of the causes which influence the frequency of births, allows us to assume discontinuity in a table of natality, established exclusively on the gradation of age, it seems right to apply some method of adjustment, it being probable that such corrected series would stand nearer to the true state of things than the rough ones.

The plan of adjusting which I followed is described on pp. 100 and 101 of my book, "Methoden der Ausgleichung von Wahrscheinlichkeiten" (Wien, 1893). This method tries to find the most probable values of the probabilities at every age, by means of two neighbouring values, and this on the following suppositions:—

(1) That each figure of the series is influenced by the two neighbouring values in the same degree.

(2) That the measure of influence is the same for the whole phenomenon.

(3) That the curve of the adjusted line be a minimum.

Thus, if the corrected value at the point x is y_x, the value to be corrected w_x and

$$\Delta^2 w_{x-1} = w_{x+1} - 2w_x + w_{x-1},$$

we have

$$y_x = w_x - u\Delta^2 w_{x-1}$$

(u = the measure of influence exercised on each figure by the two neighbouring ones) and

$$\Sigma\,(\Delta^2 w_{x-1} - u\Delta^4 w_{x-2})^2 = \text{minimum},$$

the Σ being extended over all observed values; therefore

$$u = \frac{\Sigma \Delta^2 w_{x-1}\,\Delta^4 w_{x-2}}{\Sigma\,(\Delta^4 w_{x-2})^2}.$$

The values obtained for y_x ought to be submitted to the same manner of adjusting as often as the repetition produces a change in the third decimal of the series.

The values for u are in the male table: $u_1 = 0{\cdot}2816$, $u_2 = 0{\cdot}3412$, $u_3 = 0{\cdot}4576$, $u_4 = 0{\cdot}6373$; and in the female table: $u_1 = 0{\cdot}3$, $u_2 = 0{\cdot}3$, $u_3 = 0{\cdot}275$.

This leads to the general formula of adjustment*:—

For the male table: $y_x = 0{\cdot}21 w_x + 0{\cdot}175\,(w_{x+1} + w_{x-1}) + 0{\cdot}13\,(w_{x+2} + w_{x-2}).$
$+ 0{\cdot}065\,(w_{x+3} + w_{x-3}) + 0{\cdot}025\,(w_{x+4} + w_{x-4}).$

For the female table: $y_x = 0{\cdot}28 w_x + 0{\cdot}22\,(w_{x+1} + w_{x-1}) + 0{\cdot}11\,(w_{x+2} + w_{x-2}) + 0{\cdot}03\,(w_{x+3} + w_{x-3}).$

I cannot allow myself to enter here into an enumeration of all the beauties of the adjusted table. One of them strikes the eye directly: at the important periods of life the corrected probability for quinquennial ages coincides with the rough ones. Another one is the following coincidence: multiplying the number of married couples with the corrected male natalities between 27 and 71 years,

we obtain a calculated birth-number of . . . . . . 11,662·6
whilst the real number is . . . . 11,656·7

Applying the same calculation to the female table between 19 and 57 years,

we obtain . . . . 11,675·9
which coincides with a real number of . . . . 11,676·9

II. *On the Correction of the Bigenous Natalities.*

Vienna, May 15, 1894.

The large alterations which the figures of natality undergo with the change of paternal and maternal age, allow us to regard *à priori* as barren all such adjustments as ought to be applied to the observation of cumulative ages, for instance, to quinquennial periods. Such averages depend on the number of couples in the single years of age for the time being, and admit, therefore, no such definition as would be independent of the constituent elements of the population at that time. Therefore, and in spite of the quantitative insufficiency of the material, I have—without caring for their respective weights—adjusted the simple probabilities of father and mother by a method analogous to that of WITTSTEIN.* After thrice repeating the calculation, we arrive at the following formula of adjustment:—

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* The probabilities calculated by means of these formulæ are contained in the text and also in the column w of Table C., page 874.

$$\begin{aligned}\alpha_{i,k} = \{&13a_{i,k} + 12\,(a_{i-1,k} + a_{i+1,k} + a_{i,k-1} + a_{i_1 k+1}) \\ &+ 6\,(a_{i-1,k-1} + a_{i+1,k+1} + a_{i-1,k+1} + a_{i+1,k-1}) \\ &+ 3\,(a_{i-2,k} + a_{i+2,k} + a_{i,k-2} + a_{i,k+2} + a_{i-2,k-1} + a_{i-1,k+2} + a_{i+1,k+2} \\ &+ a_{i+2,k+1} + a_{i+2,k-1} + a_{i-1,k+2} + a_{i-1,k-2} + a_{i-2,k-1}) \\ &+ a_{i-3,k} + a_{i,k+3} + a_{i+3,k} + a_{i,k-3}\} : 125.\end{aligned}$$

To facilitate the survey of this table, I used two methods of representation :—

1. I enquired what would be the average natality for quinquennial groups of ages if the births had happened in the population given with the frequency shown in the corrected table. Here are the results in Table A.

TABLE A.

Age of the father.	Age of the mother.						
	–19	20–24	25–29	20–34	35–39	40–44	45–49
–24	46·6	40·0	33·3				
25–29	44·0	40·4	33·6	26·8			
30–34	36·6	34·3	30·6	24·2	18·6	13·1	
35–39	..	29·4	25·5	22·4	17·3	10·4	
40–44	..	25·7	21·0	18·2	15·3	8·5	1·9
45–49	..	..	15·7	13·8	10·9	5·8	1·6
50–54	..	..	..	10·6	9·7	4·0	1·0
55–59	..	..	..	..	5·1	3·6	0·8

In an analogous way, I enquired what would be the natality under the same conditions (thus, on the basis of the natalities of the corrected table) if, the age of the father being given in a specified manner (that is, year by year), that of the mother is either less by 5, 10, or 15 years, or equal, or higher by 5 years.†

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* If we denote by $a_{i,k}$ the rough figures of natality at the paternal age i, and of the maternal age k, by $\alpha_{i,k}$ the corresponding corrected value, we have after the first adjustment:—

$$\alpha_{i,k} = [a^{i,k} + a_{i-1,k} + \alpha_{i+1,k} + a_{i,k-1} + \alpha_{i,k+1}] : 5.$$

This formula may be applied to the calculation of adjustment, if, as in the present case, we have to fear no discontinuities, and if the change of $a_{i,k}$ follows on partial changes of i and k between narrow limits proportionally to i and k.

† Using the signs before mentioned, and marking with $l_{i,k}$ the number of living married couples at the paternal age of i and the maternal age of k, we obtain the figures ($\alpha'_{i,k}$) of Table B by the help of the following formula:—

$$\alpha'_{\iota,k} = \tfrac{1}{5}\,[l_{\iota,k}\,\alpha_{\iota,k} + l_{\iota,k-1}\,\alpha_{\iota,k-1} + l_{\iota,k+1}\,\alpha_{\iota,k+1} + l_{\iota,k-2}\,\alpha_{\iota,k-2} + l_{\iota,k+2}\,\alpha_{\iota,k+2}].$$

The values of Table A are obtained in an analogous way.

TABLE B.

Age of the father.	The mother is younger by			The mother is older by		Age of the father.	The mother is younger by			The mother is older by	
	5 years.	10 years.	15 years.	0 years.	5 years.		5 years.	10 years.	15 years.	0 years.	5 years.
24	44·8	..	..	36·9		38	20·7	23·7	27·3	15·7	5·7
25	45·0	..	..	35·0		39	19·3	22·2	25·1	14·9	4·2
26	43·5	..	..	33·8	27·9	40	18·3	20·9	23·3	12·8	3·1
27	40·7	..	..	33·5	26·6	41	16·5	19·6	20·6	10·5	2·0
28	38·8	41·4	..	33·1	25·3	42	15·2	18·0	20·4	8·8	1·3
29	36·9	39·1	..	31·6	22·3	43	13·5	15·9	19·4	5·9	
30	34·3	36·8	..	28·7	19·3	44	11·7	14·2	16·3	4·3	
31	32·4	35·3	..	25·7	18·4	45	9·5	12·5	15·6	2·9	
32	30·7	33·3	..	24·0	17·2	46	7·3	11·6	14·9	2·1	
33	28·4	31·7	33·8	22·4	16·0	47	5·5	10·9	14·0	1·4	
34	26·4	29·6	33·5	21·3	15·1	48	3·8	9·6	13·0	1·1	
35	24·9	28·0	32·6	20·6	11·8	49	2·8	8·1	11·8	0·9	
36	23·7	26·9	30·3	19·0	10·4	50	1·8	6·5	10·7		
37	22·8	25·5	28·6	17·6	8·9	51	1·2	5·3			

2. I inserted in the corrected table the curves of the isogens—that is the lines of equal natality—at a distance of 0·05 per cent. By the form of the isogens it becomes also obvious that the formula* which Mr. FRANCIS GALTON deduced from the table of M. KŐRÖSI stands right for that part of the isogens in which the ages of the mothers are smaller than those of the fathers.

Induced by the great interest which the monogenous tables offer, as representing the fecundity of each age by itself, I undertook a second adjustment of them. Taking account of the weight of the figures, I applied for this purpose the hypothetical formula

$$w = uc^{-\alpha_1 x - \alpha_2 x^2 - \alpha_3 x^3 - \alpha_4 x^4}$$

to the method of least squares. The w here means the corrected natalities; the u, in the male table, the probability of the 25th, in the female table, that of the 19th year; x the paternal age less 25, or the maternal less 21, and $\alpha_1 \alpha_2 \alpha_3 \alpha_4$, the constants to be determined by the calculation of adjustment.

The results of this calculation are contained in the following Table C, where, for sake of comparison, are also mentioned the corrected values obtained by the preceding calculation (explained in the first letter).

The value $\alpha''_{i,k}$, which embraces the quinquennial period of $i - 2$ to $i + 2$, is obtained by this formula:—

$$\alpha''_{\iota} = \tfrac{1}{25} \Sigma [l_{i,k+\delta}\, \alpha_{i,k+\delta} + l_{i-1,k+\delta}\, \alpha_{i-1,k+\delta} + l_{i+1,k+\delta}\, \alpha_{i+1,k+\delta} + l_{i+2,k+\delta}\, \alpha_{i+2,k+\delta} + l_{\iota-2,k+\delta}\, \alpha_{i-2,k+\delta}],$$

under condition that the Σ extends itself over all $\delta = 0, \pm 1, \pm 2$.

* According to which the sum of the paternal age and the hundredth multiple of the natality forms a constant value.

TABLE C.—Corrected Monogenous Natalities.

Natality of the Fathers.

Age.	w_1.	w_2*.	Age.	w_1.	w_2.	Age.	w_1.	w_2.
20	..	43·39	38	19·24	19·24	55	2·2	2·14
21	40· ?	41·85	39	17·68	17·68	56	1·9	1·82
22	33· ?	40·47	40	16·14	16·14	57	1·6	1·54
23	33· ?	39·21	41	15·3	14·65	58	1·4	1·31
24	34·4	38·04	42	13·8	13·21	59	1·2	1·11
25	35·0	36·90	43	12·3	11·84	60	1·0	0·95
26	35·3	35·78	44	10·9	10·55	61	0·8	0·81
27	35·1	34·65	45	9·5	9·35	62	0·7	0·69
28	34·3	33·49	46	8·3	8·23	63	0·6	0·60
29	32·9	32·30	47	7·2	7·21	64	0·5	0·52
30	31·1	31·04	48	6·2	6·28	65	0·5	0·45
31	29·3	29·74	49	5·4	5·45	66	0·4	0·39
32	27·6	28·37	50	4·7	4·70	67	0·4	0·35
33	26·1	26·94	51	4·1	4·04	68	0·4	0·31
34	24·6	25·46	52	3·5	3·46	69	0·3	0·28
35	23·4	23·94	53	3·0	2·96	70	0·3	0·26
36	22·1	22·39	54	2·6	2·52	71	0·2	0·24
37	20·8	20·82						

Natality of the Mothers.

Age.	w_1.	w_2.†	Age.	w_1.	w_2.	Age.	w_1.	w_2.
16	36· ?	38·81	28	27·6	28·64	40	9·8	8·25
17	38· ?	38·23	29	25·9	27·15	41	7·7	6·89
18	40· ?	37·67	30	24·0	25·56	42	5·7	5·68
19	40·3	37·10	31	22·3	23·87	43	4·0	4·61
20	39·7	36·50	32	20·9	22·11	44	2·7	3·69
21	38·5	35·85	33	19·6	20·30	45	1·7	2·90
22	37·2	35·13	34	18·2	18·45	46	1·0	2·24
23	35·3	34·32	35	17·0	16·61	47	0·6	1·70
24	33·4	33·41	36	15·9	14·79	48	0·4	1·27
25	31·6	32·40	37	14·7	13·02	49	0·2	0·93
26	30·1	31·27	38	13·3	11·33	50	0·1	0·67
27	28·9	30·01	39	11·7	9·73	51	0·1	0·47

The rapid decrease of the coefficients which follows the rising of the powers, furnishes subsequently a justification of the hypothetical formula applied.

If we draw upon the Corrected Table (No. III.) the two monogenous curves, we can answer the question: given the age of the wife, what should be the age of her husband in order that her annual

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* According to the method of least squares

$$w = 0·368996e^{-0·0304487x - 0·0002630x^2 - 0·0001215x^3 + 0·0000020x^4}.$$

† According to the method of least squares

$$w_2 = 0·37101e^{-0·0166961x - 0·0005422x^2 - 0·0001011x^3}.$$

birth-rate should conform to the mean frequency appropriate to her age? *Vice versâ*, given the age of the husband, to find that of the wife which shall produce an analogous result. The approach of both curves at the age classes of 35 for the male, and 31 for the female, and their intersection at the point of the isogen 0·0825, is striking.

The comparison of the two calculations contained in Table C shows that, up to the point of intersection, the males have the same probabilities as the females, if for the latter we go back five or six years.

The mean deviation* is, in the male table, 0·0055, in the female, 0·0067.

The analytical form of the monogenous curves, the form and the position of the isogens justify the pposition, that

$$w = ue^{-f(x,y)}$$

is an approximate analytical expression of the surface obtained in a system of three right-angled axes, where we put on the first the age of the husband, on the second that of the wife, on the third the measure, and if the formula $f(x, y) = \text{const.}$ is regarded as the analytic expression of an algebraic curve of the third degree.

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* That is, the analytic expression for $\sqrt{\frac{[pw]}{[p]}}$, p signifying the weights, w the natalities, and the angular bracket the sums of all ages.

[MS. Tables by the author (see foot note, p. 810) are bound in two volumes, and preserved in the library of the Royal Society.—M. F.].

Bigenous Probability of annual births in 100 families
according to the age of the father and of the mother respectively

Table 3

Adjusted figures including also the regions.

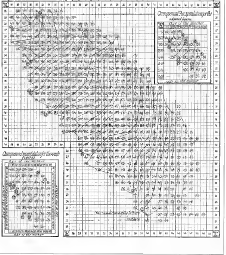

Quinquennial Recapitulation for the adjusted figures
Quinquennial recapitulation for the rough figures
The maximal curve of the fathers
mothers

TABLE II.—Bigenous Probability of Annual Births in 100 Families, according to the Age of the Father and of the Mother respectively (rough figures)

Age of the Father.	Age of the Mother.																															
	18–19	19–20	20–21	21–22	22–23	23–24	24–25	25–26	26–27	27–28	28–29	29–30	30–31	31–32	32–33	33–34	34–35	35–36	36–37	37–38	38–39	39–40	40–41	41–42	42–43	43–44	44–45	45–46	46–47	47–48	48–49	49–50
23–24	*	*	*	*	*	(32·0)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
24–25	*	(43·0)	(40·2)	[illegible]	(34·0)	(46·1)	(64·1)	[illegible]	(34·0)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
25–26	(43·5)	[illegible]	(38·1)	(40·7)	[illegible]	(47·8)	(40·2)	[illegible]	(31·5)	(25·6)	(29·6)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
26–27	[illegible]	(47·4)	[illegible]	[illegible]	46·1	33·3	[illegible]	16·7	[illegible]	(32·7)	(31·3)	(30·3)	(24·5)	(18·9)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
27–28	(61·3)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	38·4	[illegible]	28·8	31·7	[illegible]	(47·0)	(21·3)	(30·5)	(33·0)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
28–29	[illegible]	[illegible]	34·6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34·0	28·7	[illegible]	[illegible]	(28·1)	(32·0)	(35·0)	(27·0)	[illegible]	*	*	*	*	*	*	*	*	*	*	*	*	*	*
29–30	*	[illegible]	(39·7)	[illegible]	[illegible]	28·5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33·4	[illegible]	(31·2)	(18·7)	(23·3)	(26·7)	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
30–31	*	(32·0)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12·6	[illegible]	14·1	[illegible]	37·1	19·8	22·4	(41·0)	[illegible]	(18·1)	(19·6)	(19·2)	*	*	*	*	*	*	*	*	*	*	*	*	*
31–32	*	*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	21·5	[illegible]	[illegible]	[illegible]	[illegible]	24·3	[illegible]	[illegible]	[illegible]	(20·6)	(25·3)	(20·1)	*	(16·8)	*	*	*	*	*	*	*	*	*	*	*
32–33	*	*	(27·5)	[illegible]	47·4	[illegible]	36·0	[illegible]	[illegible]	29·6	31·6	[illegible]	[illegible]	28·4	[illegible]	16·7	(18·3)	(20·0)	(15·1)	[illegible]	(10·8)	*	*	*	*	*	*	*	*	*	*	*
33–34	*	*	(38·4)	(45·9)	(27·0)	28·1	25·2	[illegible]	28·7	[illegible]	30·6	[illegible]	[illegible]	[illegible]	24·5	19·7	20·6	(25·4)	(10·8)	(20·3)	(15·0)	(17·8)	(6·0)	*	*	*	*	*	*	*	*	*
34–35	*	*	*	[illegible]	[illegible]	(27·4)	22·3	28·0	25·8	[illegible]	30·1	35·0	[illegible]	[illegible]	28·7	23·7	[illegible]	(18·1)	[illegible]	(16·6)	(11·0)	(23·8)	(13·3)	*	*	*	*	*	*	*	*	*
35–36	*	*	*	(28·8)	[illegible]	(31·8)	[illegible]	31·6	28·4	23·5	[illegible]	[illegible]	[illegible]	[illegible]	21·4	20·5	[illegible]	[illegible]	(23·8)	[illegible]	(14·1)	*	(6·6)	*	*	*	*	*	*	*	*	*
36–37	*	*	*	*	[illegible]	[illegible]	[illegible]	(35·4)	[illegible]	23·7	[illegible]	37·1	21·1	[illegible]	21·0	[illegible]	[illegible]	[illegible]	15·5	[illegible]	(13·0)	(15·1)	(10·7)	(14·0)	(6·7)	*	*	*	*	*	*	*
37–38	*	*	*	(27·0)	(31·4)	[illegible]	[illegible]	(21·5)	(37·7)	[illegible]	[illegible]	[illegible]	21·6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20·5	15·1	(17·5)	(20·1)	(6·5)	*	(6·5)	*	*	*	*	*	*	*
38–39	*	*	*	*	(34·0)	[illegible]	[illegible]	(35·8)	(22·5)	[illegible]	20·7	20·7	18·1	[illegible]	[illegible]	21·1	[illegible]	16·4	18·8	14·0	12·4	(10·8)	[illegible]	(11·5)	(5·4)	*	*	*	*	*	*	*
39–40	*	*	*	*	*	*	[illegible]	[illegible]	[illegible]	(16·5)	(22·5)	[illegible]	26·1	25·7	20·0	19·4	20·0	16·0	[illegible]	[illegible]	14·5	16·0	(12·7)	(10·3)	(7·4)	[illegible]	*	[illegible]	*	*	*	*
40–41	*	*	*	*	*	(23·1)	[illegible]	[illegible]	[illegible]	(16·0)	[illegible]	(21·5)	13·4	(21·4)	[illegible]	[illegible]	18·4	17·0	[illegible]	16·1	[illegible]	[illegible]	9·5	(6·9)	(5·7)	(4·5)	(1·3)	[illegible]	*	*	*	*
41–42	*	*	*	*	*	*	*	*	(19·0)	[illegible]	[illegible]	[illegible]	(17·7)	(44·4)	(22·5)	(19·6)	18·4	12·5	17·1	[illegible]	14·3	[illegible]	11·0	(8·9)	(7·3)	(6·1)	(3·2)	[illegible]	*	*	*	*
42–43	*	*	*	*	*	*	*	*	(26·0)	(18·3)	[illegible]	[illegible]	[illegible]	(17·3)	18·4	19·1	18·0	17·0	15·0	[illegible]	13·8	[illegible]	[illegible]	(10·1)	6·6	(4·0)	(1·0)	(0·4)	(1·0)	*	*	*
43–44	*	*	*	*	*	*	*	*	*	(19·8)	(20·3)	[illegible]	[illegible]	[illegible]	[illegible]	16·1	(13·0)	(11·8)	16·7	[illegible]	[illegible]	[illegible]	10·7	(11·7)	5·0	(4·0)	(1·1)	[illegible]	(0·4)	(0·7)	(0·5)	*
44–45	*	*	*	*	*	*	*	*	*	*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	(13·0)	[illegible]	[illegible]	(14·9)	12·9	12·0	(20·9)	9·8	(15·6)	6·6	(4·5)	1·4	[illegible]	(0·4)	(0·7)	[illegible]	*
45–46	*	*	*	*	*	*	*	*	*	*	(16·7)	(16·5)	[illegible]	[illegible]	[illegible]	(14·0)	[illegible]	[illegible]	9·5	(15·0)	6·0	16·3	9·1	9·7	5·0	5·1	2·1	8·7	(1·0)	(0·5)	(0·0)	*
46–47	*	*	*	*	*	*	*	*	(14·8)	*	*	(21·0)	[illegible]	[illegible]	(10·5)	(12·8)	[illegible]	(9·1)	12·0	6·7	9·1	[illegible]	9·2	6·8	8·1	(0·0)	2·2	(2·0)	0·7	(2·1)	(0·0)	(0·0)
47–48	*	*	*	*	*	*	*	*	*	*	*	*	[illegible]	(14·3)	(16·2)	(13·1)	(14·1)	(9·4)	(15·6)	[illegible]	6·8	(11·6)	6·5	[illegible]	6·5	(4·7)	2·5	[illegible]	(0·7)	(1·3)	(0·0)	(0·0)
48–49	*	*	*	*	*	*	*	*	*	*	*	*	(11·3)	*	(12·5)	[illegible]	[illegible]	(15·4)	[illegible]	[illegible]	7·0	(11·4)	7·5	[illegible]	3·0	[illegible]	2·2	9·0	(1·0)	[illegible]	0·1	(0·0)
49–50	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(10·4)	*	(13·1)	[illegible]	[illegible]	(11·6)	(6·6)	(7·0)	(4·8)	(3·3)	(4·2)	[illegible]	(5·0)	(2·5)	(0·5)	(2·0)	(0·5)	(0·0)
50–51	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(6·6)	(8·0)	(8·4)	[illegible]	[illegible]	(14·4)	5·0	(5·7)	5·6	[illegible]	[illegible]	1·1	[illegible]	(0·8)	3·0	(0·0)
51–52	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	(4·5)	(5·6)	[illegible]	(0·0)	(0·0)	[illegible]	[illegible]	[illegible]	(0·0)
52–53	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4·6	[illegible]	(1·4)	(0·0)	[illegible]	[illegible]	0·0	[illegible]
53–54	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	[illegible]	(7·0)	[illegible]	(7·4)	(1·4)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	(0·0)	(0·0)
54–55	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(6·8)	*	(6·0)	(6·1)	(3·0)	5·0	(2·6)	(5·3)	(0·8)	(0·8)	(0·2)	(0·0)	(0·0)	(0·0)
55–56	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	[illegible]	*	(2·4)	*	(1·6)	(4·0)	(0·0)	(0·6)	(1·1)	(0·0)	[illegible]	[illegible]
56–57	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(5·8)	(4·0)	(3·1)	(5·9)	(2·4)	(1·0)	(0·2)	(0·5)	(0·4)	(0·5)
57–58	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(4·0)	*	(1·6)	*	(2·4)	(1·7)	(0·0)	(0·0)	(0·0)	(0·0)	(0·0)	(0·0)
58–59	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(0·0)	(0·0)	(0·0)	(0·0)	*
59–60	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	(0·0)	(0·0)

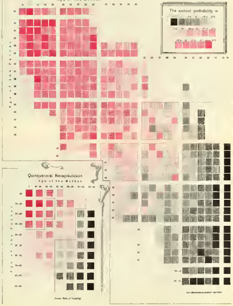
The figures in brackets are deduced from less than 100 families.

Where the number of families was less than 25, no probability having been calculated, the respective place is marked by an asterisk.

The full line connects the maxima of each column; the dotted one those of each line.

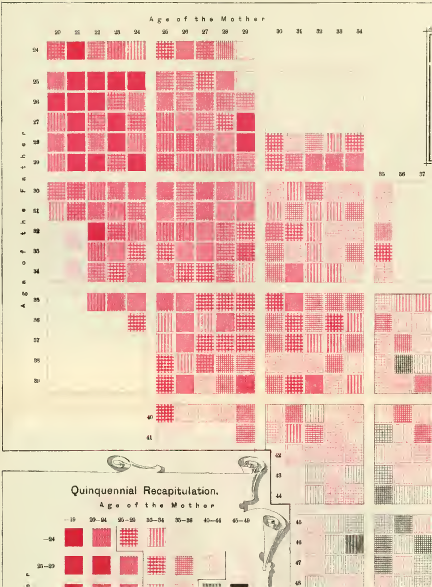
Bigenous Table of Natality.

Annual probability of birth for marriages of the following age combinations:



Bigenous Table of Natality.

Annual probability of birth for marriages of the following a



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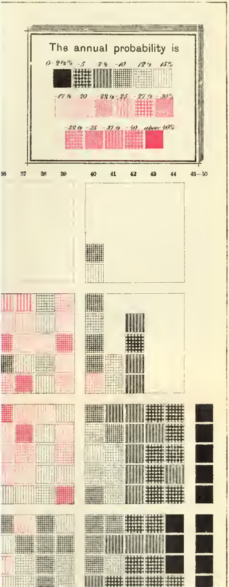
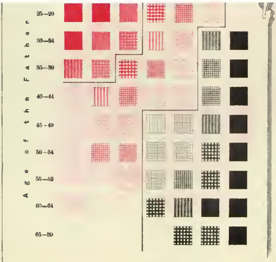
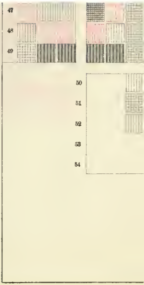
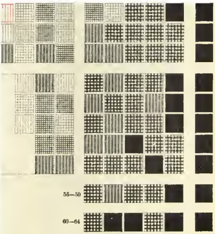
ving age combinations:





Körösi Table of Natality





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